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English and American Practice Compared.

THIS has been done for us in a long article by an American architect, Mr. R. C. Sturgis, in No. 11 of the current volume of the Boston *Architectural Review*, a quasi-monthly publication which, like some similar publications in France, appears just when it pleases, and not at stated dates, so that the two latest numbers have come into our hands within a few days of each other. It is interesting to note how our methods of architectural practice appear to the American eye. Mr. Sturgis, though he is not always quite accurate in the impressions he conveys of English architectural practice, has evidently given a good deal of attention to the subject, and we presume that in regard to American practice he is quite competent to speak. It is curious that in regard to some points in English practice he regards as advantages what a good many of us regard as decided disadvantages.

The contrast drawn at the outset between the positions in England and America is striking, and one that may not have occurred to every one. Mr. Sturgis regards the English architect as having come into existence with the Renaissance, when the English mason, though willing to build in the new-fashioned way, could not do so without some man learned in the detail to show him. We should perhaps amend the idea that the "architect" took his rise with the Renaissance by saying that the *name* (in the modern world) dates from that period; the person existed in the middle ages, only he had to do rather with directing design as a whole than with details, which were executed to some extent *conrannent* and according to prevailing types. But it was an architect or master-mind who designed the front of Peterborough, and not a mason, and we may take it that the same type of master-mind settled, for instance, such points as the plan of the piers, which has so important an effect on the architecture, and that these were not left to the fancy of the next mason who came on that part of the job. And of course, when people talk of the architect dating from the Renaissance, we have only to remind them that the architect, according to positive literary evidence, existed in ancient Greece as a specially skilled man, and under that name, which we have merely adopted from the Greeks.

The point in the present argument, however, is that, on the most limited interpretation of the word architect, the English architect has existed for two or three centuries, and is therefore, as our American critic remarks, "a man with definite duties established by long usage, hardly different from what they were two hundred years ago." It seems that the American architect is a personage of far more recent development. "At the time of the Revolution" (*i.e.*, the establishment of the Independence of America) "there were, so far as we know, no architects whatever in this country;" and he goes on to say that the American "Old Colonial" architecture was merely the work of trained mechanics who followed the architectural books and prints then attainable, and worked under the guidance of owners who took an intelligent interest in the then popular study of the Orders. After the Declaration of Independence there was naturally much public building to be done, and architects were sought for and were nowhere to be found; even so recently as the middle of the century the architects of the country could be counted on the fingers, and these were all in the eastern States. But is not this rather an exaggeration? Surely the Capitol and the White House were designed by an architect; his drawings, we believe, are in existence, or some of them.

"Architecture was then an agreeable occupation for a gentleman of refinement and education, and was not taken very seriously by the architect or by his client. The client did not know just what service he should expect for a commission of five per cent. on the cost, and the architect was occupied largely with the design, the principles of which he understood but vaguely, and the practice of which he understood not at all. Quite different all this from the condition in England.

The drawings of this period would hardly pass muster as preliminary sketches to-day; full-sized details were either inadequate, showing lack of knowledge, or entirely wanting; and specifications were meagre."

This however was much the same in the Renaissance period in England; look at Wren's drawings for instance. That is going rather far back, perhaps; but at the time of the Declaration of Independence (1776) there was certainly not much elaborate drawing or specifying among English architects. It was not till 1840 that Bartholomew published his book on specification, with a special view to putting that part of the business on a more scientific footing. Comparing the two countries about the middle of the present century, no doubt a striking difference would be found. We were then in the full tide of the Gothic revival, and all the enthusiasm and drawing which it called forth. America had had a kind of Greek revival in the thirties (in imitation of the English one), and, according to Mr. Sturgis, along with it a certain renewed interest in mediæval work—though this, we imagine, did not amount to much. Then came the terrible Civil War, and all architectural progress was knocked on the head for the time. Then, after the war, arose that sudden impulse to architectural art in the United States, which is the most remarkable and most swift development of the kind in modern times. It came, says the author, rather from the clients than the architects in the first instance; they demanded a change, and the younger generation of architects responded to the call, went to Paris and elsewhere, travelled and studied, and "in twenty years the profession of architecture, from being but an amateurish copy of the English profession, has come to be one of far greater complications and responsibilities."

The great difference is stated to be that the English architect is doing to-day for a commission of 5 per cent. just about the same amount of work that he has been doing for the past one hundred years, while

the American architect is doing ten times as much as his predecessors in his own country, and considerably more than his English brother is doing at present. Theoretically the statement about the English architects is true; what they profess to do might be defined in the same general words as one hundred years ago; but practically we are certain that the English architect of to-day does a great deal more for his money than his predecessor of a century back. Buildings are much more complicated, and attention is required to drainage, ventilation, and heating, matters which in the older period pretty well took care of themselves. Still it may be admitted that the English architect has more precedent to go upon than his American brother. We incline to think that the real difference is that the American architect is required to work in quicker time; and that along with this he has less of a system to go upon. This is, we think, at the bottom of what Mr. Sturgis admits in so many words—that the English architect does his work more artistically than the American. The latter finds that "on the large pieces of work there is no time for study, on the small pieces of work one cannot afford to give the study." This is a rather damaging admission, for we feel that it can be said that a good many English architects in the present day give a degree of study to small works, out of pure desire to do the best with them, which it does not "pay" to give. But the essential difference in the conditions seems to be that the English architect can get time, and the American cannot. After enumerating all the various points which have to be considered in a modern building, Mr. Sturgis says, with incontrovertible truth, "it is impossible that the best work should be produced when all must be accomplished in the least possible time." With certain classes of buildings—hotels, theatres, offices—this system of hurry and of building against time has largely invaded us also, with mischievous results; but in such buildings as a Town Hall or a church an English architect can still get time to study his design and its details.

Then follow a number of interesting comparisons between the English and American systems of work. In preliminary sketches less time is taken in America than in England, but it is claimed that the general level of draughtsmanship is much higher, and that there are many young men in American offices who can produce in six hours such an effective perspective sketch as most English draughtsmen would take six days over. This is possibly true; we have evidence that the proportion of first-rate draughtsmen in America is large, we see so many good drawings from that side of the water. Whether this facility is an unmixed good Mr. Sturgis questions; it is apt to lead to the drawing being regarded as an end instead of the building. The general American practice is to use $\frac{1}{4}$ in. scale for working drawings, an unnecessarily large scale, as he says, and wasteful of time and drawing materials. It is possible that this is of English origin, however, for the older among us can remember when it was a usual scale in English offices. He highly commends our practice of making $\frac{1}{2}$ in. details of parts of an elevation to explain the smaller drawing. In regard to details he finds that there is more duplicating of mouldings, ornaments, mantels, and the like in English offices, whereas with the American there is a restless desire to treat every detail in a separate manner, which leads to a multiplication of detail drawings. As to the best English offices we rather question the statement. The following passage is of interest, as the impression of an American—we do not say it is quite accurate:—

> "However unpleasant the general attitude of the English, that nothing is so good as what England produces, it is at least better than the reverse, so common with us, that nothing is good unless it is foreign. In architecture, as in all else, England is content with its own work, borrows sparingly from outside, and when it borrows it quickly stamps the loan as its own property, appropriates it, and makes it English.
>
> English detail is therefore of a nature which is always familiar to the English mechanic—it is to be noted that it is executed nine times out of ten by Englishmen—and the architects may therefore leave a good deal to the skill, knowledge, and judgment of the mechanic. The American architect, working in half a dozen styles at once—and it need hardly be said not a master of all of them—must have his work executed by Italians, or English or Frenchmen, who may or may not be familiar with the style, or the architect's drawings and methods. It is therefore essential that the drawing shall be accurate and complete, and that the superintendence of the execution shall be frequent."

We do not think the English architect leaves much to the mechanic. Some of our critics say he ought to leave more.

It is in the specification work that, according to Mr. Sturgis, the great difference exists between the English and American practice. The quantity surveyor apparently does not exist in America. Mr. Sturgis seems to consider him an unmixed blessing. His statement of the case is that the English architect has only to make his drawings clear and complete, and send them to the quantity surveyor with a sketch specification, and having taken out the quantities the surveyor "writes for the architect his final specification." We know that this is done in a good many cases, but we must decline to accept it as a general statement, and we think the system a bad one. As a testimony of the completeness with which the quantities are made out, he remarks that "it is not infrequent to find a builder making his estimate on the quantities without seeing either the specifications or the drawings." So it is, and it is a wretched system. How can a builder really understand the work he is undertaking to carry out in such a case?

It appears that the clerk of works is also unknown in the States, and that consequently American architects are constantly endeavouring to explain to their clients what is meant by "superintendence," and that the architect cannot be at the works all the time. "In England no such explanation is needed; every building has its clerk of works paid by the owner." Mr. Sturgis does not forget to point out that by the quantity surveyor system the owner pays 7 per cent. instead of 5. To be sure, he probably saves it by the results of the competition system of tendering, which in these days would be practically impossible without the quantity surveyor; but all this solely arises from the almost universal prevalence of the competing system, which is not conducive to the best work, since it implies that the work is always carried out by a contractor who has left so small a margin for profit that he is tempted to cut everything as close as possible. The system has taken possession of us now, but it may be doubted whether its disadvantages do not far outweigh its advantages. In America, it appears from a further passage in Mr. Sturgis's paper, there is even more competition tendering than in England, many of the minor works by specialists being put up to competition, instead of merely selecting a well-known and approved firm for the work. The way they get through it without quantity surveyors appears to be that they make more of a jump at the result; "each man has his own method and his own ready road for reaching results, and would take off in three days that for which an English surveyor would require three weeks." In that case we should say there must be a great deal of scamping of work among American contractors. If competition tendering is to be the order of the day, there is no sort of doubt that our system is the best, the most honest, and the most businesslike, and that the owner's 2 per cent. to the surveyor is money well laid out. The curious thing, if one cares to look at first principles instead of accepted practice, is the manner in which the quantities, originally merely a means by which the builder got materials for his estimate, have come to be tacitly considered as a kind of integral part of architecture, the whole resulting from the modern desire to get buildings as cheap as possible; a cause at all events of one of the principal differences between ancient and modern buildings.

While maintaining that the American architect does far more technical work for his 5 per cent. than the English architect—a conclusion of the truth of which we are not in a position to judge—Mr. Sturgis thinks a corresponding advantage results from the English architect having time to give to the artistic designing of accessories. That a great amount of such work is done by English architects is certain, and that it is often done practically almost as a labour of love. Whether such work ought, however, to come within the category of services for which 5 per cent. is paid on the gross contract sum is more than questionable.

On the whole we think the general summary made by Mr. Sturgis is in favour of English methods of architectural work; nor do we gather that he himself thinks otherwise.

THE EDUCATION OF THE LAND SURVEYOR.

PROBABLY there is no art whose underlying principles are more simple, or whose practice involves greater mathematical refinement than that of land-surveying. From the earliest times, this art has been practised, and in the present day it is increasingly required, both in thickly and in sparsely populated countries. Yet, as a separate profession, it can hardly be said to have an established existence. Surveyors almost invariably follow some other calling to which surveying forms a subsidiary though useful adjunct. Most architects and estate-agents, and many engineers, find it imperative that they should also be land-surveyors, whilst some who are engaged in other occupations are impelled to add the words "and surveyor," often as a correct designation, but sometimes for purely decorative purposes. The establishment of the Surveyors' Institution, by providing a

common ground on which those practising various branches of surveying may meet, has had an important influence in securing proper recognition for the profession. More than this, by the inauguration of qualifying examinations for Associateship and Fellowship, the Institution has done much to raise the standard of education, and to stimulate and direct the efforts of students. Every endeavour has been made to give a real and practical value to the examinations, and, as the President said in his inaugural address last month, the Institution had already done something towards curing the defect that candidates might pass on book work alone. He further remarked upon the desirability of raising the age limit at which candidates should be examined for Fellowship, and suggested that the examination should be divided into two parts, the first confined to book work and the second to practice pure and simple.

Without doubt, these are excellent suggestions in every way worthy of serious attention, but there is still another point requiring consideration, not only by the Institution, but by those who intend to make surveying their future profession. In the United Kingdom, where a comprehensive system of Ordnance Survey has furnished a large selection of data, it is rarely necessary for the surveyor to exercise a knowledge of higher geodesy. Consequently, students have little opportunity of acquiring practical acquaintance with the higher branches of work, and correspondingly small inducement for studying them theoretically. In other countries, and notably in our Colonies, different conditions prevail, and local governments show a marked preference in favour of candidates for public appointments, who have received local training and diplomas. It is largely in consequence of these facts that a recently published treatise on surveying,* dealing with ordinary and geodetic methods, has been compiled by Mr. Reginald E. Middleton and Mr. Osbert Chadwick. The circumstances leading to the compilation of the treatise are thus stated by the authors :—

"About three years ago, a number of gentlemen interested in this question, and in the improvement of the standard of qualifications for English diplomas as surveyors, met at the Surveyors' Institution, by kind permission of the Secretary, and formed a committee to consider what steps might best be taken to secure a better position for the English student who might wish to seek employment in one of our Colonies. The Council of the Surveyors' Institution was approached, and their Secretary informed the committee that their members were prepared to look favourably on any efforts made in the direction indicated."

Accordingly, an arrangement was made that the Committee should have a text-book prepared and submitted for the approval and adoption of the Council, in connexion with the examinations held under the auspices of the Institution. The work now forming the subject of consideration was the result; and here we may remark that, as a matter of convenience, the treatise has been issued in two parts. In the first, to which we shall more specifically refer, the principles of ordinary surveying are described, and in the second problems requiring geodetic treatment and astronomical determination are discussed, as well as methods of conducting marine, route, and other special surveys.

As evidencing the thoroughly representative character and value of the work, we may well mention the fact that several eminent surveyors have been contributors. The compilers, as they modestly term themselves, are both well known in engineering and surveying circles and to the world at large. Mr. Middleton is associated with engineering undertakings of considerable magnitude—amongst his achievements in surveying may be mentioned the setting out of the site and work for the contractors at the Forth Bridge—whilst Mr. Chadwick is an engineer and surveyor who has performed valuable duty to the Empire in connexion with the Colonies. Other contributors were the late Major-General Woodthorpe, C.B., Surveyor-General of India; Colonel Bogle, formerly Instructor in Military Surveying at Chatham; and the late Mr. G. H. Leane, F.S.I. an examiner to the Surveyors' Institution and to the Royal Agricultural Society. Having these names before us, it is only reasonable to suppose that the treatise itself should contain a thoroughly practical instead of a "professorial" exposition of the subject. The authors do not profess to bring forward original information; they have rather aimed at the inclusion in one book of teaching which has hitherto been necessarily collated by students themselves from several books. Valuable guidance is thus afforded as to the course of study most desirable from a practical standpoint, and for the purpose of qualifying for the examinations of the Institution.

Chain surveying, once the chief if not the only mode of preparing plans, is simply but methodically explained in the first chapter. The necessary implements are described, and minute directions are given for their use and as to the proper way in which a beginner should set about the survey of small estates and farms. Such little difficulties as may be presented by chaining over obstacles, chaining on sloping ground, and ranging past obstructions of various kinds are explained away, and, in order that the student may have no possible excuse for not appreciating the methods to be pursued, two small surveys, one of a single field and the other of an entire farm, are carried out in full detail, and the demonstrations are rendered complete and realistic by the addition of plans and field books. Of course, it is assumed in the initial chapter, as throughout the treatise, that the student possesses a fair knowledge of mathematics, and especially of trigonometry, which is a fundamental part of all surveying. Inaccuracies in chainage and in interpretation may result from many causes, some of which are pointed out, and the permissible limit of error is defined. The chapter concludes with instructions relative to the plotting of plans from particulars noted in the field-book.

We have referred in detail to the first chapter, because we think it to be conceived in a way calculated to encourage the beginner by giving him at the outset an opportunity of doing some useful and interesting practical work. Being thus stimulated, he is far more likely to attack intricacies which await him than if his mind had been burdened by a study of too much purely theoretical matter. When the next chapters are reached, it is found desirable that the principles of optics as applicable to lenses should be explained, and also that some mention should be made of magnetism and barometric pressure. These important subjects might have received, without disadvantage, more detailed treatment, though the authors have probably assumed that physical science will in every case be studied independently. Instruments and their adjustment next form the object of attention, and the authors then pass on to the consideration of traverse surveying, by the aid of which "each survey point is determined by one angular and one linear measurement, instead of by two or more linear measurements, as in chain surveying." Thus may be found the relative positions of a number of points delineating a road or boundary, without the necessity of fixing relative inclination of the several station lines by measuring subsidiary lines. Consequently, the plan of a forest can be made without the chaining of lines across it; surveys may readily be made of lakes over which chaining would be impracticable, or of tracts of land, for the measurement of which incidental trespass might otherwise be unavoidable. For the measurement of angles in work of this kind the theodolite is preferable to the compass, and the inclinations of several lines to each other or to a standard line of direction may thus be more accurately determined. When the student has arrived at this part of his subject, he will find much greater scope both for mechanical and for mathematical exactitude. In the treatise we find that geometrical rules necessary for the performance of work, and for the checking of angular measurements, are clearly defined and explained, so that comprehension is morally certain of attainment. Various methods of notation and of plotting are discussed, and a complete traverse survey is exemplified by the aid of plans and by the reproduction of a field-book.

The section devoted to triangulation does not include primary triangulation, as practised when the survey of a great extent of country is made, and in which points may be at distances of from twenty to one hundred miles apart. Such work involves the use of the most powerful instruments, and the spherical form of the earth must be duly considered. Primary triangulation is described in Part II. of the treatise, which has not yet been issued for review. In minor triangulation less powerful instruments are employed, and the spherical form of the earth may generally be neglected. By the methods which are explained, areas exceeding 100 square miles may be surveyed, and it will therefore be seen that maps covering considerable tracts of country can be readily prepared. As in triangulation there is only one linear measurement, that of the base line from which relative distances of numerous points are determined and their co-ordinates calculated, the utmost care becomes an absolute essential. The advantage of a mathematical method, if completely applied, is that errors, if existing, must inevitably become apparent sooner or later. On the other hand, the disadvantage of human nature is that errors are absolutely unavoidable. Both these axioms have to be remembered by the surveyor, and in this section our authors devote ample space to modes of correction, devised for a sufficient reconciliation of human frailty with mathematical infallibility. Plane-table surveying is not particularly suitable for a country with so

* "A Treatise on Surveying." Reginald E. Middleton, M.Inst.C.E., and Osbert Chadwick, M.Inst.C.E. E. & F. N. Spon, London. 1899).

variable a climate as that possessed by England. On the Continent and in the tropics, however, the plane-table is much used. It has been developed into an instrument of considerable precision, and when equipped with the tacheometric telescope it will be found extremely useful for filling in details and for making large scale surveys of considerable extent. For instance, we may mention that the details of the Hong Kong town survey were filled in by the plane-table to a scale of $\frac{1}{1000}$, whilst the preliminary survey of the St. Gothard Railway was entirely conducted in a similar manner. Elementary and elaborated methods of plane-table surveying are explained by the authors, and an interesting and thoroughly practical chapter on levelling and contouring forms the conclusion of the volume. We have already spoken of its chief claims to notice, but it possesses one other worthy of attention, namely, that from beginning to end the diction is simple and intelligible. Therefore it forms no addition to that unfortunate type of text-book where the task of wrestling with ingenious obscurity of expression is added to the natural difficulties of a subject.

NOTES.

The Vestibule of the Royal Academy. THE alteration and decoration of the vestibule of the Royal Academy, which has been recently carried out by Mr. T. G. Jackson, has resulted in very much improving the first impression given to the visitor on entering the door. The counters for the sale of catalogues and for the taking in of umbrellas, which formerly intruded into the floor-space, are now kept in line with the walls, each of them being comprised within an arched opening with a wide soffit decorated with modelled plaster work. The coupled columns flanking the base of the main staircase are now of a finely-marked grey-toned cipollino marble from Eubœa (not before used in England), which is repeated in pilasters round the vestibule. A high oak dado, with a small frieze of rather flat carving, is carried along the walls between the pilasters. The floor is paved with marble in large white and small black squares. In the ceiling have been fixed some circular paintings by Angelica Kauffman, old possessions of the Academy, and which formerly decorated the rooms in Somerset House where the Academy exhibitions were once held. When the Academy quitted Somerset House in 1838, these panels were removed to Trafalgar-sqare and used for ornamenting the library ceiling. When the Academy again removed, in 1869, to Burlington House, the panels were also removed but not immediately put to any use. As may be supposed, they are not very decorative in effect, in the modern sense of the word; but there is an interest attaching to them, and this was probably the best available manner of exhibiting them and turning them to account. One merit of the new treatment of the vestibule, besides getting rid of the unsightly projecting counters, is its essentially quiet effect; there is nothing obtrusive or prominent. We could rather have wished, however, that a mosaic floor of some symbolic design had been adopted, instead of the rather uninteresting checquer of squares. The carving has been exceedingly well executed by Mr. Childs, of Messrs. Farmer & Brindley's.

Homes for Invalided Soldiers. WE print in another column a gratifying announcement as to a scheme for providing cottage homes for soldiers permanently or temporarily invalided in the war, in which it is proposed that the building trades of the country should have the opportunity of making their gift in aid of those who have been fighting for their country, by contributing materials, according to their several trades, for the erection of such cottage homes. We feel quite sure that such an appeal will not be made in vain; indeed, we believe it has already received a considerable response. The idea is originally due to Mr. Edwin O. Sachs, architect, and chairman of the British Fire Prevention Committee, who will devote a room in their premises at No. 1, Waterloo-place to carrying on the business connected with the scheme. The practical carrying out of the work is in the hands of Mr. Sachs, Mr. F. R. Farrow, Mr. Hammond, and Mr. Ellis Marsland, while Sir John Taylor, Mr. Blashill, and Mr. Arthur Cates are acting as advisers; so that we may be assured that the buildings will be properly carried out. All these gentlemen are of course giving their services gratuitously.

A False Claim for Work Done. A CASE heard at the Leicester Quarter Sessions ought to be a warning to builders' employees who are tempted to cook their wages sheet. J. W. Arnold, a man in the employ of Messrs. Broadbent & Co., slaters, of Leicester, was employed on piecework. In connexion with the slating of a church just completed, he wrote to the firm to have the work measured up, and was told to measure it up in conjunction with the builder and get the builder to sign his measurement sheet. When the measurements came in there was a claim for double pointing, which the firm did not believe had been done, and which they thought they recognised as in Arnold's handwriting. They obtained an indictment against him for endeavouring to obtain money on false pretences, and ultimately the prisoner pleaded guilty and threw himself on the mercy of the court. In consideration of previous good character the judge only bound him to come up for judgment when called on (the prosecuting firm appear to have behaved with great forbearance), but he uttered a general warning to workmen that if they exaggerated what they had done, and led their employers to think that they had done more than they had, "they would bring themselves under the criminal law, and subject themselves to very severe punishment." The prisoner in this case seems to have got off very easily for a barefaced attempt to defraud his employer.

Street Gullies. IN the last number of Dr. Orme Dudfield's four-weekly Report on the sanitary condition of the Parish of Kensington, there are some remarks as to street gullies in London. The statistics are mainly based on a Report of the Vestry's Surveyor some years ago, but which Dr. Dudfield appears to regard as practically good up to the present date. It is stated that the number of gullies in London trapped with a brick trap and catchpit at the outlet to the sewer is still greatly in excess of any other form of trap, and that most of the surveyors expressed an opinion in favour of it—a statement which may be accurate, but is certainly surprising. The virtues attributed to the brick gully are that "it is more substantial, does not choke so readily, and demands much less attention," all which, as Dr. Dudfield observes, are excellent points from an executive officer's point of view. The main objection to the brick gully is, of course, the notoriously inefficient trap. The objections urged against the stoneware gully are liability to fracture and to stoppage. The first-named, as Dr. Dudfield observes, might be got rid of at once by making them of iron. He concludes, and we entirely agree with him, that it would be not only a great sanitary improvement, but also a most popular proceeding from the public health point of view, if, at the earliest possible date, all brick catchpit gullies were abolished in favour of pan siphon-trapped gullies.

Fire Tests with Ordinary Glass. No. 33 of the pamphlets of the British Fire Prevention Committee records the results of some tests on the resistance to fire of ordinary window glazing. The subjects were three casements glazed respectively with $\frac{1}{4}$ in. plate glass, 32 oz. sheet glass, and lead lights in 4 in. squares (the quality of glass in them is not stated). There was to be a thirty minutes' fire increasing gradually to not more than 1,200 deg. Fahr., with the application of water, first at half-time from the outside, and at the end of the thirty minutes from inside. None of the windows, however, survived even for the half-time water test. The flame burst through the 32 oz. sheet glass in six minutes; the lead glazing collapsed in seven minutes; and the flame burst through the $1\frac{1}{4}$ in. plate glass in twelve minutes, and in fourteen minutes the whole of the glass had fallen out. The result does not surprise us, but it may be useful that it should be shown by experiment how futile are ordinary glass windows as a check to the spread of fire. At some points in the testing house the temperature recorded by the pyrometer appears, however, to have been rather higher than the contemplated 1,200 Fahr., but not so far in excess as to make much difference in the conclusions to be drawn.

American Bridges. THERE can be no doubt that the growing use of the word "American" as an adjective applied to examples of engineering work must be gratifying to citizens of the United States in general, and more than gratifying to those in particular who are occupied in mechanical industries. We have every reason to believe that America is still engaged in the operation of "going ahead," and the progress made in bridge building within the past generation shows the practical and business-like methods which are pursued on the other side of the Atlantic. Inferior facilities for the manufacture of iron and steel plates no longer act as a drag upon the energies of the American engineer, and bridges of all types, made by him in the present day, typify originality of design and excellence of workmanship, combined with economy of production. Plate girder bridges, fully 100 ft. in length, are now being built, which compare favourably with any manufactured in this country. When the necessity arose for

designing bridges of length greater than was desirable in the form of the plate girder, the American devised an improved form of truss, known as the pin-connected truss, giving the maximum carrying capacity and requiring the minimum quantity of material. The result, as compared with the typical English bridge, was an extremely light skeleton structure, and the adoption of pins in place of rivets for connexions proved to be conducive to accuracy and facility both in construction and in erection on the site. Consequently, American bridges of admitted excellence have been supplied in various British possessions, and at prices considerably below those possible to our own builders. Cantilever construction has not hitherto been exemplified in any works approaching the Forth Bridge in magnitude, although plans have been drawn for a 2,000 ft. cantilever across the Hudson river at New York, which it is estimated would be relatively less costly than the bridge over the Forth. Considerable development has taken place with regard to the braced arch, and the bridge across the Niagara, being 840 ft. long, is by far the most important structure of the kind in existence. Suspension bridges have received much attention in the United States, and the American wire-cable bridge with stiffening truss is regarded as the most economical type of the kind yet designed, and as one which is more readily erected than any other, where a single span of great length is necessitated. A notable example of this form of construction will be furnished by the completion of the new East River bridge in New York.

Electricity as an Aid in Timber Seasoning.

WE have received from the Secretary of the Institution of Mining Engineers a copy of Mr. Vecqueray's paper upon "The Noden-Bretonneau Process of Seasoning and Preserving Timber and other Fibrous Substances by means of Electricity." The timber is placed in a wooden tank, in the bottom of which is fixed a serpentine copper steam-pipe. Above the steam-pipe is an open-grid false bottom, covered by sheet lead, which is connected with the positive pole of the dynamo. Upon this sheet lead the timber to be treated is placed, and above the timber are fitted porous wooden frames, having felt and canvas bottoms These trays support another sheet of lead which is connected with the negative pole of the dynamo. A solution of boro-resinate of soda is run into the tank until it has risen to within 2 in. of the upper surface of the timber, and pure water is placed in the porous trays to ensure electrical connexion between the timber and the negative pole. By means of the steam-pipe the solution is maintained at a temperature of about 100 deg. Fahr. After five to eight hours' treatment the timber is removed, and dried in the open air or in warm chambers. It is claimed that by this process timber can be seasoned in from one to two months, and is then in a better condition than naturally-seasoned wood. Also that the greener the timber the more readily can it be treated; and that such wood as maritime pine and grisard, which cannot be satisfactorily dried naturally, can now be properly seasoned and rendered fit for general joinery purposes. The cost of the seasoning is quoted as amounting to about 3d. per cubic foot, but it is probable that it could be reduced if the process were worked on a large scale. The process is an interesting one, and may prove of much value, but the treated timber must be subjected to a more complete series of tests than those described in the paper before implicit reliance can be placed upon it.

Large Dynamos.

THE recent improvements made in the design of dynamos for the power houses of electric tramways have led to changes in the design of plant not only for traction work but also for lighting and power distribution stations. The possibility of building huge dynamos which will run smoothly in practice having been demonstrated by the tramway engineers, the electric lighting engineers are now adopting larger machines in order to get the advantage of the increased efficiency. In the new works of the Metropolitan Supply Company, at Willesden, there will be several dynamos of over 3,000 h.p. each. In other words, each dynamo will be able to supply some 60,000 lamps. As the total number of lamps connected on to the mains of this company is about half a million, these dynamos which will shortly start working ought to be sufficient to enable the company to tide over the heavy load and give its consumers a continuous supply. Its efforts in the past, although Mr. Plowden called them "frantic and praiseworthy," have given little satisfaction to its clients. In the new works of the Midland Corporation for electric power distribution and in the power station for the Glasgow Tramways there will be several dynamos ranging from 2,000 to 3,500 h.p. These dynamos are, however, comparatively speaking, small when compared to those which the Manhattan Elevated Railway Company of New York has just ordered from the Westinghouse Company. There will be in the power station eight dynamos of over 9,000 h.p. each. The rotating part of the dynamo will be 32 ft. in diameter, and will be mounted directly on the shaft of the engine. The combined weight of each dynamo and engine will be nearly 1,000 tons. The dynamos will all be delivered this year, so it is probable that within twelve months the conversion of the New York Elevated to electricity will have taken place.

Steel Framing for Ceilings.

SOME interesting details of ornamental ceilings in the new Masonic Temple, Boston, U.S.A., are given in a recent number of the *Engineering Record*. Several of the halls and more important rooms have ceilings with curved or irregular surfaces which are plastered upon steel lathing attached to skeleton frames, comprised of steel bars, tees, channels, and angles, suspended from the beams above. Although the architect of this building determined all essentially artistic points connected with the ceilings, partitions, and cornices, and showed in his designs all details of the finished surfaces, he wisely left the constructional engineer a free hand with regard to the internal steel framework. As far as possible, standard methods of furring were adopted, whilst the skeletons were cut, fitted, and erected on the spot. For thin partitions, the frames were made of small vertical angles or channels with light horizontal tie-bars; in curved surfaces, the larger bars formed the directrices and smaller bars the elements of the curves, whilst the ribs, mouldings, and outlines of cornices were made by bending small bars to suit the cross-sections and by connecting them with longitudinal strips. In every case the principal members were bolted together at intersections, and the skeletons were covered with expanded metal, on which the plaster surface was laid to conform to the required lines and to receive the final ornamentation. The large hall affords a very good exemplification of the possibilities of this method of construction. It has a flat ceiling which is divided into square panels by transverse and longitudinal ribs, and the panels are subdivided into triangular compartments. At one end of the room is the proscenium arch, built of plaster on a skeleton of triangular cross-section; the pointed shoulders in the intrados are formed over light curved strips, fastened in pairs to the inner arch strips and suitably braced. This framework is stiffened by the expanded metal and plaster. Although in this particular case the arch is not altogether happy as to general effect, it serves to illustrate a mode of construction which, besides being light and strong, lends itself readily to the expression of any form of design in keeping with the material.

The Gas and Allied Trades Exhibition.

THE most conspicuous objects in the Gas Exhibition now being held in the Royal Aquarium, London, are the incandescent gas-burners and the acetylene exhibits. The Exhibition as a whole can scarcely be considered worthy of the industry or industries it is supposed to represent; but there are, nevertheless, several stalls which make an admirable display and afford striking illustration of the material advance which has been made during the last decade in the methods of utilising gas. The New Sunlight Incandescent Company in particular has a most brilliant array of mantles and shades of various shapes, sizes, and colours; and this company is worthily supported—or opposed—by the somewhat similar exhibits of the Welsbach Company, and of Falk, Hadelmann, & Co. Several of the leading gas-stove manufacturers are represented, and the well-known firm of Crossley Bros. demonstrate with their gas engines the utility of gas when applied to the production of electric light. The acetylene industry is represented by Turr's Acetylene Gas Syndicate, the Buffington Gas Light Company, Messrs. Thorn & Hoddle, and others. The Exhibition will remain open until the 23rd instant.

The Education Exhibition.

THE "English Education Exhibition," open till the 27th inst. at the Imperial Institute, though it is not without the bazaar and shop element, is of more general interest than we expected to find it. It is not perhaps very easy to see how Education can be the subject of an exhibition; but the two great Universities, as well as that of Durham, University College, London, University College, Liverpool, various other Institutes, and the principal public schools of England, have made this an opportunity for collective exhibits of illustrations of their buildings and of subjects connected with university and school work, which are of considerable interest. Among the contribu-

tions sent from University College will be found a portfolio, the contents of which illustrate the work of the classes of architecture in that college, comprising photographs illustrating buildings actually erected by former students of the present professors, and also a considerable collection of studies by past and present students. University College, Sheffield, is noticeable for its exhibits of engineering models. On the other wall, parallel to that and the screen on which the universities and secondary schools are illustrated, are ranged the exhibits of work done at the School Board schools of several of the principal cities, that of the School Board for London of course occupying the largest place, and showing a great deal of good practical and technical work. In a gallery reached by a rather circuitous and inconvenient route is a large exhibit of technical work, art students' work, building work, &c., done under the London School Board and under various other institutions. The whole exhibition is of course of a very miscellaneous character, but there is a good deal of interest to be got from it.

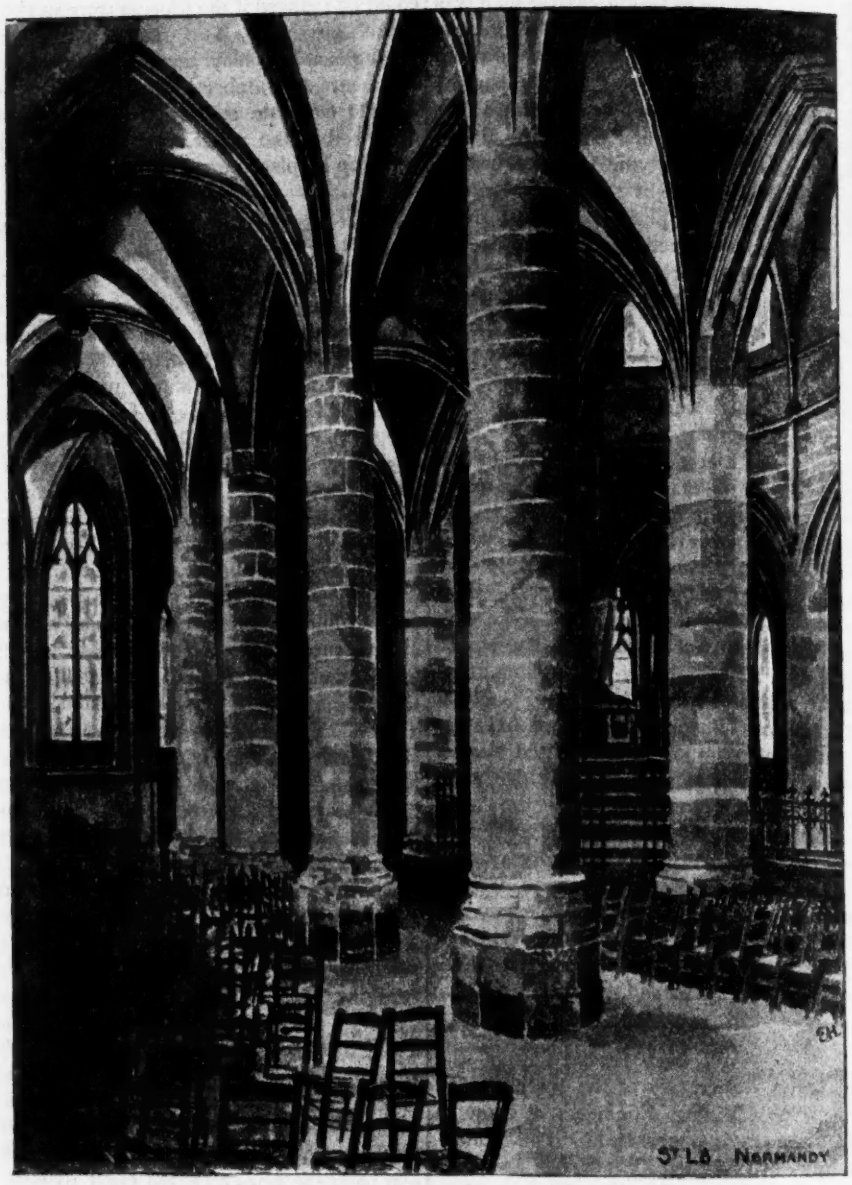
The Hanover-square Rooms.

IT is stated that this building, which stands at the north-west corner of Hanover-street, and has been occupied of late by the St. George's Club, is about to be converted into shops and sets of residential chambers and flats. The original rooms, considerably altered during recent years, had been erected on the site of Lord Dillon's town house for Gallini, and were used for concerts which King George III. and members of the Royal family frequently attended, and for masquerades and routs. Cipriani painted the ceiling of the great room, measuring 90 ft. by 35 ft. After the destruction by fire in 1830 of the old Argyll Rooms in Regent-street (built by Nash for Joseph Welch), the Philharmonic Concerts were transferred to the Hanover-square Rooms, and were continued there until 1866. Before that time the Rooms had been used for the performance of the "Concerts of Ancient Music," and for a long period the annual performances of the "Messiah" were given there on behalf of the Royal Society of Musicians. We believe that the association of the building with musical entertainments ceased with the close of the first series of the concerts of the Henry Leslie Choir. The present premises are held on a lease, of which thirty-one years are unexpired.

Mr. Saltfleet's Drawings.

THE Society of Fine Arts has on view a collection of sixty water-colour drawings by Mr. Frank Saltfleet entitled "From London to the Sea," consisting entirely of shipping scenes on the Thames. Considering the wording of the title, it would have been more effective if the drawings had been hung in a regular sequence in regard to the scenes, commencing with the Thames at Westminster and going on in progression down the river; this has not been done, and they are arranged rather promiscuously. Mr. Saltfleet is excellent at shipping, which he thoroughly understands; he is not so successful with water. Thames water is not very clear, certainly, but it does not, as in No. 11, look like wet sand; and generally speaking the movement and effect of water are not well conveyed; an exception is "The Top of the Tide, Deptford" (27), where the water is treated in a freer and bolder manner than in most of the others. As studies of shipping many of the drawings are admirable; we may mention especially "Closehauled" (32), two red-sailed barges doing their best to work to windward, gunwale deep in the water on the lee side—this is perhaps the best work in the collection. Among others are "Unloading a Norwegian Ice-boat, Rotherhithe" (4); "Straw Barge below Greenwich" (5); "Red Sails and White Sails, Woolwich" (7), a fine effect of colour and atmosphere; "The Fussy Tug" (12), a capital likeness of a sort of craft we have all seen from the Embankment; "Nearing Northfleet" (23), in which the large ship in the foreground is very well treated; and "The Domes of Heaven the Towers of Earth" (34), a very fine sky hanging over the Tower Bridge. We regret to see that the Society have had to give up to their landlord the large north room, the most spacious though not the best lighted of the galleries; the new south room is admirably lighted, but not so large as the old room.

THE LATE MR. DOLLMAN.—In the obituary notice of the late Mr. Dollman in our last issue the sentence "at the age of thirty-three he entered the office of Mr. G. Basevi" should have been "in the year 1833," at which time Mr. Dollman was twenty years old.



Sketch in St. Lô, Normandy. By Mr. R. H. E. Hill, A.R.I.B.A.

SKETCH IN ST. LÔ, NORMANDY.

THE Church of Notre Dame (formerly a cathedral) is a fine specimen of Late French Gothic, and is well worthy of study by architects. It occupies a fine position at the top of the hill on which the town is built, and its two handsome western towers and spires are very conspicuous. There are double aisles to nave and choir, and on the north side is one of the very few external stone pulpits now to be met with surmounted by a fine crocketted canopy.

The windows are filled with stained glass presented by Louis XI. in memory of a repulse by the town of the Bretons in 1467. The town is beautifully situated on the River Vire, and derives its name from St. Laudus, one of its early bishops.

The sketch was made from a position in the north aisle of the nave looking east, and shows the French characteristic of dying the vaulting ribs and arch-moulds on to the columns without the intervention of capitals. The mouldings are very similar to contemporary English work.

R. H. ERNEST HILL.

THE SOCIETY OF MINIATURE PAINTERS.—The private view of the fifth annual exhibition will take place on Tuesday, 16th inst., at the Modern Gallery 175, Bond-street, W. The exhibition will be open to the public from the 17th inst. to February 24.

BUILDING CRISIS AT EDINBURGH.—It is stated that a very grave crisis has arisen in the building trade at Edinburgh, and two firms have had to suspend payment. One of these is said to be the largest speculative builders in the city, and the liabilities are understood to be of very large amount. A number of other firms have been badly hit, and further failures are anticipated. The principal cause of the collapse is the dearness of money, which has wiped out the margin of profit, and the disposition of banks to restrict advances.

THE DURABILITY OF PAINT.

THIS subject is one of very great importance to all users of paint, whether it be the house decorator, coach painter, or sign painter, and before the question of how durable a paint may be can be considered, there are a great many points to be taken into account. Thus, we must first of all consider the nature of the components of the paint; for, needless to say, although all paints are compounded mechanically in the same way, and, as a general rule, with the same vehicles and driers, yet the nature of the pigment (*i.e.*, colouring) matter has to be considered because no intelligent explanation of the physical and chemical changes in a paint can be given until the nature of the pigmentary component is considered; this is so, because pigments are so very diverse in their chemical composition, some being oxides of metals, others carbonates, others sulphates, chromates, arsenates, silicates, &c., while some few are of animal and others of vegetable origin. Now, it will be conceded that it is impossible to make such diverse materials produce always a uniform compound (chemically considered). Next to knowing the nature of the pigmentary components, we have to consider the physical influences to which paint is exposed before we can fully explain its permanence or durability. Let us just reflect for a moment on what these influences are. Whether the surface that is painted be an interior or exterior one, there is always a certain amount of dust and gritty particles floating or being blown about in the air. On exterior surfaces such gritty particles as sand, &c., play a very destructive part in the wearing away of paint, because they scratch the paint, and so, by abrasion, wear it away, and, at the same time, by cutting furrows in the hard exterior surface of the coat of paint, allow moisture and deleterious gases to reach the still soft interior portion of the coat of paint. This scratching of the surface of paint is a mechanical influence, and it is more destructive on a hard coat of paint than on a soft and, therefore, elastic one. To guard against this destructive influence there is very little remedy. The only feasible one is to make the paint one that will be as elastic as possible. To produce such an elastic one, as little driers as possible should be used, and instead of a boiled oil being used as the vehicle in which to grind up the pigment, an oleo-resinous medium should be used, or else linseed-oil varnish be the sole vehicle. Such fluid will allow the coat of paint to become gradually solid throughout its depth at a uniform rate, and dry to a homogeneous elastic mass. On interior surfaces, of course, such mechanical abrasion of the surface of paint would not occur to such a great extent, but there must be another destructive influence, viz., dirt and dust clinging to the surface, and to effect the removal of such dirt the paint is frequently cleaned. If the cleaning be effected by merely dusting the paint with a dusting-brush or a cloth, there is then a certain amount of friction, and consequent mechanical abrasion of the paint; while if the paint be cleaned by washing with soap and water, and possibly soda and water, there are other destructive influences set to work to reduce the permanence of the paint. The influences in this case are chemical ones, because the cleansing fluid is of an alkaline nature. Now alkalies will set up decomposition to both paint and varnish, because an alkali will convert the oil vehicles of a paint into a saponaceous compound, and in the case of a paint, the alkali will unite with the resinous component of the varnish to form a resin. These facts are easily verified. Thus, melt a little soda in water and pour this alkaline fluid into linseed oil; you will find that the mixture forms a soap, which is soluble in water. Again, cut up some common soap and dissolve it in a little water by boiling it therein, and when the soap has dissolved, you will be able to mix either linseed oil, turpentine, paraffin, or water with such soap water—in other words, the soapy mass forms a ready menstruum, which will unite with any of these fluids. Yet again, dissolve some soda in water and boil some resin—copal, amber, sandarac, or common resin (colophony)—in the alkaline fluid; you will find that the resin unites with the alkali and forms a new compound—which, in fact, is called a resinate. If you collect this resinate in a filter, you will be able to dissolve it in either water, spirit, oil, or turpentine.

Now, from these facts we can understand why it is that when a coat of paint has been washed a few times it shows signs of wearing off, so much so, in fact, that a coat of paint can be made so attenuated that you will eventually reach the primary coat; then we see that the washing of a coat of paint is a chemico-physical destructive influence.

Apart from this chemical disintegration of a coat of paint or varnish by washing it, there is also another destructive influence engendered, viz., the penetration of moisture through the paint to the surface beneath; and if the surface be an absorbent one, then moisture will be absorbed beneath the surface of the paint and thereby become a source of destruction. In this way the absorbed water will be gathered up beneath the paint in patches if the paint be subjected to the influence of heat, and as this confined water cannot escape through the paint, it will cause the paint to swell or bulge out from the material in which it is laid, and so cause blisters in the coat of paint. The water in these blisters, when it becomes saturated into the pores of the wood, will leave the bulged-up paint detached from the material on which it is laid. At a subsequent date, as these bulged-up patches of paint dry, they will become brittle, and then fall off, leaving exposed bare patches of wood beneath.

If the surface of the paint be at all crusted, the absorption of water is very great; but it is not necessary for the paint to be crusted in the least, as the oil vehicle of paint is not waterproof, but it readily allows the impenetration of water. On this point a well-known American expert on painting materials* made the following experiment—to quote his own words: "We made some experiments by covering pieces of glass with ordinary linseed oil, and allowed them to dry and harden for a couple of weeks; these coated glasses then had water placed upon them, and were covered so that the water would not evaporate. To our astonishment, when we examined the glasses the next morning, we found that the dried linseed oil had soaked up water, and wherever the water had touched it the coating presented the appearance of a shrivelled-up apple. On allowing the water to evaporate, the coating dried down again to its place, but it is quite evident that the dried linseed did not repel water, and that under the action of the water disintegration was taking place. Dried linseed oil containing pigment is a different matter, as will be explained later on, and it is also possible that, as this progresses, dried linseed oil may so change chemically that it is less acted on by water. Our experiments do not give definite proof on this point, but we are very strongly convinced that the action of water is, all things considered, the most potent cause of the deterioration and destruction of paints. Indeed, we have already made some study on the question of rendering the paint waterproof, and we know of others who have spent a great deal of time in trying to develop a waterproof coating to go over paints and varnishes. Our belief is that if any good paint could be rendered absolutely waterproof its durability both in protecting the surface and in appearance would be more than doubled; and we do not at the moment know of any field in which the reward would be more sure and abundant than for some simple device which would render paints incapable of being acted on by water.

Our belief as to the destructive action of water on paint is so strong that we use a water-test as a quick method of arriving at the durability of any proposed mixture. . . . After looking over all the possible causes of deterioration, as above described, we decided that water alone was the chief single cause; and, as said above, if a proposed paint or mixture does not stand under water, we regard it as inferior. We really know of no single quick test so good as simply to expose the paint to water for a few hours. It is not at all strange to find, as the result of such a test, both changes in the shade of the pigment and changes in the integrity of the paint."

The above words were printed nearly ten years ago, and what conclusion the writer of this has come to by now it is impossible to say, but according to recent experience with paint, and experiments with ditto, the cause of linseed oil being permeable to water is due to the elimination of glycerine in the oil as it dries. This linseed oil consists chiefly of three fatty acids and a peculiar base glycerine, and by oxygen combining with these fatty acids the oil becomes oxidised into linoxide, while the base glycerine is expelled. Now as glycerine is soluble in water in all proportions, it will be conceivable that linseed oil, during its drying process, consists of partially oxidised fatty acids and this water-absorbing glycerine, consequently the drying linseed oil does not present a perfectly water repelling film, but one that is permeated with water-imbibing components, and thus the vehicle of drying oil is pierced with holes, so to speak, where the non-drying glycerine particles lie. This fact appears to have been unknown to Dr. Dudley, for throughout his writings on the subject of paint, the writer has failed to notice any reference to it.

The following chemical equation will explain the action of the expulsion of glycerine from the linseed oil during the process of its drying (that is, in correct words, the oxidation of the fatty acids or conversion into linoxide).

When an oxide is added to a fatty (not hydrocarbon) oil, the oxide combines with the fatty acids to form an oleate of the metallic base of the oxide, and glycerine is produced, *e.g.*:—

The chemical formula of olein (one of the fatty acids of both linseed oil and olive oil) is $C_3H_5.3C_{18}H_{33}O_2$; while the chemical formula of sodium hydroxide is Na O H.

Now, when these two bodies are mixed together the following reaction occurs:—

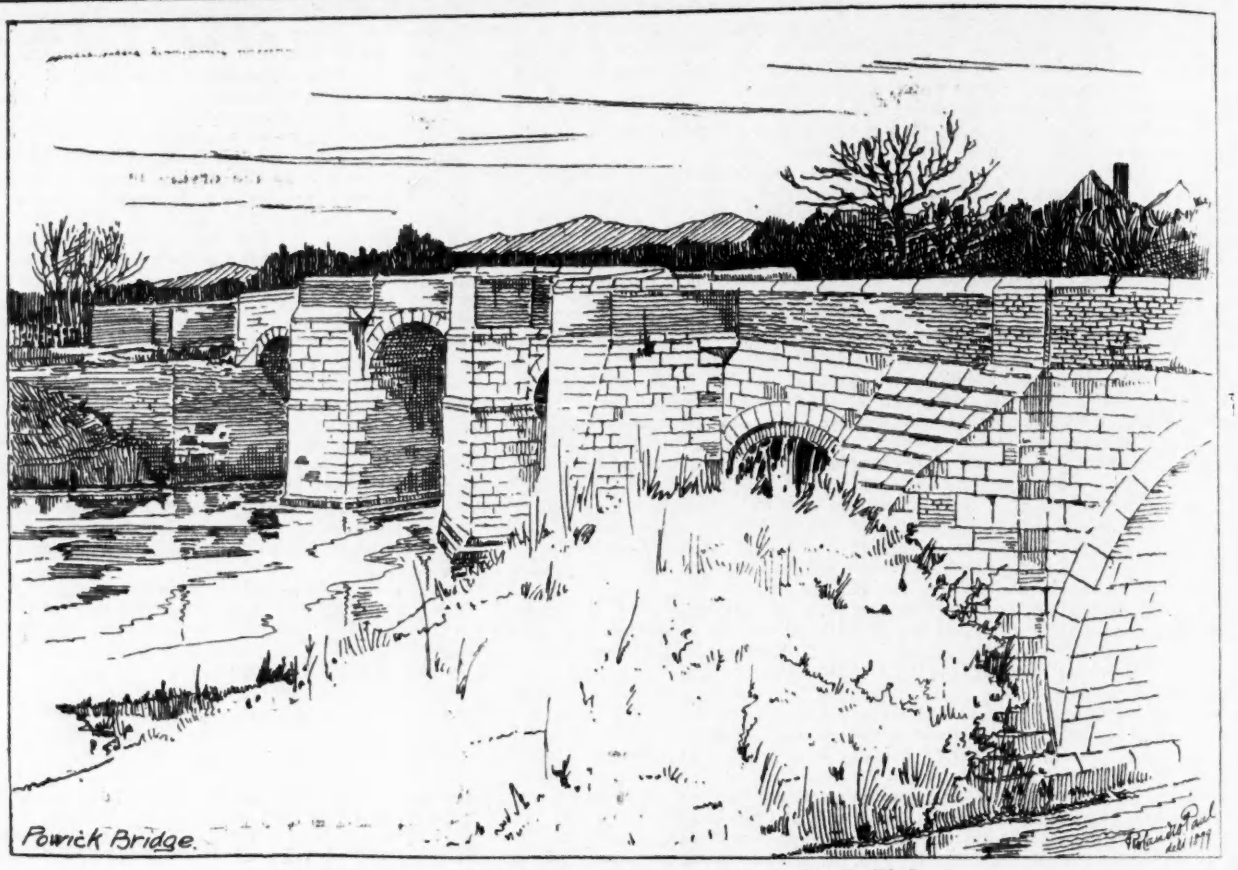
$$C_3H_5.3C_{18}H_{33}O_2 + 3Na\,O\,H = 3Na\,C_{18}H_{33}O_2 + C_3H_5(O\,H)_3.$$

Sodium oleate. (Soap.) Glycerine.

If instead of sodium hydroxide (*i.e.*, soda lye, which is only used in soap making) we mix an oxide of a metal with linseed oil, a similar reaction occurs, but of course the oleate produced is the oleate of the metal forming the base of the oxide; thus if it be red oxide of iron pigment, the oleate is an oleate of iron; if the oxide be of lead—as red lead or litharge—then the oleate is of lead, a lead soap, and so on. Now some of these metallic oleates or soaps are soluble in water—particularly so those of lead—and others not readily soluble, but are of a non-drying or pulverulent nature. Such, for example, as that produced by mixing zinc-white with linseed oil.

Now, every one knows that common washing soaps are soluble in water, and that as they dissolve a large amount of froth or scum is produced, but every one does not know that such froth or scum is due to the presence of resin in the soap, yet such is the case. Soapmakers, to increase the weight of the soap at a cheap rate, add what they call a "filler" to the soap mass produced by the union of the lye, and oil or fat; such filler is either common resin, fuller's earth, lime, or some other cheap body which will form a scum when the soap is rubbed up with water. In this we see the resin (which in this case has become a resinate by its combination with the soda lye) is also a body soluble in water. From this fact it is easy to understand how it is that a coat of paint or varnish after being washed with soap and water, or soda and water, a few times will gradually wear away and become attenuated. Yet another cause of want of durability in a paint is its liability to peel off. Dr. Dudley, on this point, says, "It is well recognised that in certain places paints do not adhere well to the surfaces, and it is also well recognised that some paints do not adhere as well as others. This is a marked characteristic, so far as our experience goes, of white zinc, namely, that it peels. We have never noticed any other pigment which possesses this property in any marked degree. It is difficult to say why this pigment should peel so badly. The most plausible theory which we have ever run across is that the zinc white combines with the oil used in the paint forming a species of zinc soap, and the zinc soap we know to be a brittle, non-adhesive substance. We do not think this theory has ever been definitely established by experiment, and give it for what it is worth." As we have already mentioned, Dr. Dudley apparently was unaquainted with the chemical reaction that occurs between pigment and the constituents of fixed oils; the equation given above fully explains the cause of such brittleness. Every painter knows that a mixture of red lead and linseed oil forms a solid putty, which eventually becomes insoluble in water, but such compound although hard is not very brittle. A similar mixture of zinc white and linseed oil

* Dr. C. B. Dudley, chemist to an American railway company.



Powick Bridge, near Great Malvern. From a sketch by Mr. R. W. Paul.

however would form a brittle mass that could easily be pulverised.

Some reader may ask how is it that, if oleate of lead or lead soaps are soluble in water, that this mixture of red lead and oil is insoluble in that fluid? The answer is this: Red lead, which is an oxide of lead, not only combines with the fatty oil acids of the linseed oil, but at the same time also combines with the glycerine that has been eliminated from the oil, and thus a solid mass is produced of a mixture of red lead and glycerine; as if litharge and glycerine be made, you will find that a very useful cement is produced by such mixture. Now, it is easy to see that if the compound formed by pigment and vehicle is of a brittle, pulverulent nature, that it will not possess much adhesiveness, but be readily brushed or shaken off the surface on which it is laid as soon as the elasticity of the oil is lost by the drying of the oil; hence the peeling of the paint.

Another point concerning the peeling or non-adhesion of a paint to a particular surface is given in the cases of painting galvanised iron and of zinc. It is not every kind of paint that will adhere to such material. This in the case of the galvanised iron is probably due to galvanic current set up by the action of the fatty acids on the iron and zinc with which it is galvanised, but in the case of zinc such electric current cannot be supposed to exist, as there is only one kind of metal present. The writer's investigations on this point have so far not provided sufficiently tangible proof to attempt to offer an explanation on the cause of such non-adherence. Possibly the non-adherence is due to the glycerine which is eliminated from the oil vehicle being driven to the under surface of the paint, and as the zinc is non-absorbent the coat of paint cannot, owing to the layer of glycerine beneath it, became adherent to the zinc surface. Still another deleterious influence that destroys the durability of a paint is the action of noxious gases on the paint; such influence is a chemical one. Sulphur is a substance which readily combines with lead salts to form a new compound, therefore, the action of gases in which sulphur is a component, such as sulphuric acid gas, is precisely the same as mixing lead salts and sulphur together. In the case of a paint the oil vehicle protects the lead pigment from actual contact with the sulphuric fumes for some time, but as we have already said, the oil vehicle is not waterproof, therefore the combination of the sulphurous fumes with the glycerine and water that is in the paint would produce sulphuric acid, and this acid in the paint would react on the lead pigment of the paint and form sulphide of lead, which is black or brownish. Every painter knows how dark a coat of white lead paint will become after exposure to the air for some time, whether the exposure be in the interior or the exterior of a dwelling. The darkening to a dirty drab hue is simply due to this cause. Another destructive influence of deleterious gases is the action of ammonia gas. This gas is of an alkaline nature, and thereby it, to a small extent, disintegrates the oil or varnish vehicle of a paint, whereby a further decomposition of the paint can occur.

The influence of light on paint has been demonstrated to be one of a destructive nature as regards some pigments, chiefly those of an organic origin, and those which owe their colour to the presence of an aniline dye. It has been demonstrated by experts that the destructive action of light is chiefly due to the presence of moisture; in dry air the destructive element is very feeble. The actual kind of destructiveness is a weakening or fading of the tone of colour of the pigments. As we have already shown that moisture is present in a paint (due to the presence of the glycerine and the absorption of water by the glycerine) it is easy to understand that fierce sunlight will cause a bleaching or fading of tone. The influence of light is a physical one, but it is conceivable that some physical action may set up a chemical one in the paint components. Yet another cause of want of durability in a paint is due to the nature of the material on which the paint is laid, if it be absorbent much of the oil vehicle in the paint may be absorbed if the material be not properly primed. In other cases the material which is painted may be a non-absorbent one and in other ways the material and paint may be antagonistic to each other, but cases can only be dealt with locally by the painter himself who alone can best know what is the right kind of paint to employ.

The final destructive influence in the durability of paint is that of chemical action, but chemical reaction is too intricate to deal with in this paper, and requires a separate paper to itself.

H. C. STANDAGE.

NEW CLOCK, CHOBHAM CHURCH.—A new clock was started going on Saturday last in the tower of this church. It was made and fixed by Messrs. J. W. Benson, Limited, of Ludgate-hill, London, who have made many other large clocks in the neighbourhood.

PICTURESQUE SPOTS NEAR MALVERN.

UNDER this title Mr. Roland W. Paul has produced a small set of very charming pen sketches of a few places of picturesque or architectural interest near Malvern. They include Powick Bridge, Colwall Church, Pickersleigh House, Little Malvern Priory Church, and Easington Manor House. They are lithographed to a uniform size, and form a set in a suitable envelope.*

We give a reprint of one of them, Powick Bridge. It is a curious specimen of the irregular architecture of many old country bridges, owing to their having been repaired and the arches rebuilt at different dates. The second arch from the foreground, with its elliptical line, is obviously a good deal later than the piers.

Powick Bridge was the scene of a skirmish before the battle of Worcester. A couple of miles higher up the Teme (which it crosses) is another old bridge, at Bransford; the piers of this, however, alone remain, the road being now carried on girders laid on the old piers.

NEW MARKET HALL AND MARKET SHOPS FOR LEEDS.

THE designs by Messrs. Leeming & Leeming which were awarded the first premium in the recent competition for a new market hall and shops for Leeds, and which have since been adopted by the City Council, have been exhibited to the public in the Municipal Buildings, Leeds. Unfortunately the promoters of the competition have not thought it advisable to exhibit the whole of the drawings submitted in the competition, nor even those which have been awarded the second and third premiums, so that it is impossible to compare the designs which have met with the approval of the Council with the unsuccessful ones. It is only reasonable and just to the other competitors, and to the public who have to pay for a building, the estimated cost of which exceeds 80,000*l.*, that the whole of the designs should be open for inspection. We believe, however, that only six designs were submitted altogether, which is an unusually small number for such a costly and important undertaking. The competition was doomed more or less to failure from the commencement on account of the conditions. We noted that

* They are published at the Devereux Gallery, Belle Vue-terrace, Great Malvern.

the Leeds and Yorkshire Architectural Society, at the time these conditions were issued, protested against them, and we suppose that is the reason why so few of the local practitioners competed.

The competitions for the Cartwright Memorial Hall at Bradford, a building which was to cost about 40,000*l.*, and that for this market hall, which is to cost over 80,000*l.*, were both instituted about the same time; and it is remarkable that for the former, where the conditions were exceedingly well arranged under the guidance of an eminent architect, who was appointed assessor *before* the competition was advertised, there were about 120 competitors; while in the latter case, where there were many objectionable clauses in the conditions, and no assessor was appointed at the commencement, there were only six competitors. When will promoters of competitions learn that it is to their interest to formulate conditions having some consideration for the architects, and thereby obtaining a greater response to their invitations?

The building here proposed is shown in five plans, on full double-elephant sheets of paper, by four water-colour perspective drawings also double-elephant in size (elevations were not asked for), and one sheet only of sections. The plans are to one-eighth scale, and are all fully coloured up showing the materials to be used. This represents an unnecessary amount of work to ask architects in good practice to undertake on the slender chance of gaining the competition. Returning to the proposal as shown here, we find the scheme consists of a central hall 243 ft. by 102 ft., covered with iron and glass roofs, surrounded on three sides, towards Vicar-lane, Kirkgate, and Ludgate-hill, by shops having no connexion with the market, but facing into those streets. On the remaining side the hall abuts against the ends of the shop blocks of the existing market, the alleys of which are made accessible from the proposed new hall. There are corner entrances to the hall at the angles of Vicar-lane and Kirkgate and Vicar-lane and Ludgate-hill, and north and south doors into Kirkgate and Ludgate-hill. The central hall has a central and north, south, east, and west avenues, with forty-three shops against the outside walls and eighty-four stalls facing into the avenues, and a balcony, 6 ft. 6 in. wide, round, with an upper tier of shops. There are staircases to this balcony at each angle of the building and adjoining each of the entrances. The shops facing into the streets have show-rooms, kitchens, and living-rooms over on first, second, and third floors, and a fourth floor in the roof.

The plan seems a very conveniently arranged one. We suppose modern commercialism is chiefly responsible for the elevations. The principal impression they give is that the building is quite unlike a market. For an ordinary street frontage of shops for Shaftesbury-avenue or Oxford-street, where as much plate glass as possible was an all-important condition for the ground floor, the design would be very good, but there is no suggestion of a market anywhere. There are three stories of heavy stonework or terra-cotta, with gables forming a fourth story, standing upon very little apparent support, and this weak effect is heightened by heavy pavilioned roofs, circular domes (which stand on ordinary oblong show-rooms below, and are quite unexpressed on the plan), turrets, and heavy gables. The entrances are shown to have large groined-vaulted archways flanked by massive turrets, all standing on glass. If some solid stonework could be obtained on each side of the archways and to the angle turrets and a much simpler roof devised, the external appearance of the building would be materially improved. The detail of the ironwork to the roofs of the hall would be better if simplified; one looks in vain for any originality or any departure from the manufacturer's usual pattern book.

In conclusion, we must repeat that the Leeds City Council are establishing a very bad precedent in not exhibiting the whole of the designs submitted, and thereby creating an element of suspicion which we are sure they would be the first to repudiate were the point properly brought before them.

WORKHOUSE INFIRMARY, LISKEARD, CORNWALL.—The new infirmary which has been erected by the Liskeard Board of Guardians was opened a few days ago. The contractors for the new building were Messrs. Bartlett & Hobbs, of Linkinhorne; Mr. J. Sansom, of Liskeard, being the architect.

MAGAZINES AND REVIEWS.

THE *Architectural Review* (Boston), Vol. VI., No. 12, contains an interesting series of illustrations of the decorative treatment of the Magazine Room of the University Club, New York, by Messrs. McKim, Mead, & White. These are in classic—exceedingly classic—style, but there is some novelty as well as refinement in the treatment of the details. The same architects' general and detail elevation of the Brooklyn Institute, however, contains nothing which might not have been got out of books of Greek architecture; and we observe that the same issue contains a long and enthusiastic letter from Mr. Frank E. Perkins, of the University of Pennsylvania, declaring (and glorying in the fact) that the Ecole des Beaux-Arts has been accepted as the real source of teaching in architecture. It is an excellent system—for Frenchmen; what we regret is that American artists should be so ready and even eager to make themselves into French artists. "The Elimination of the Superfluous," is the title of an article by Mr. W. R. Emerson, who draws a good contrast between the simplicity of some of the palaces of the Renaissance and the amount of ornament in modern designs for similar buildings. It is rather amusing to find that in this article the Ecole des Beaux-Arts' prize designs are cited as the special sinners in this respect—and with reason. Their authors are never content with simplicity, but are always endeavouring to outvie each other in the production of designs of the most tremendous and showy character.

In the *Berlin Architektur-Welt* the section of architecture is occupied entirely with dwelling houses of one kind or another, of which the most pleasing to English eyes are the smaller suburban examples. In the town houses there is far too obvious an endeavour after doing something noticeable. The exceedingly rough chromo-lithograph sketch of the entrance to a house in the Thiergartenstrasse was surely not worth either the separate plate or the expense of printing.

In "Quarterly Notes on Roman Britain," in the *Antiquary*, it is mentioned that some important excavations have been commenced at Melandra Castle, near Glossop, by local archæologists, with the assistance of Mr. J. Garstang. Melandra is a small Roman fort 400 ft. by 350 ft. square, near Dinting Station on the Great Central Railway. Mr. Garstang and his party have cleared the east gateway, part of the walls, the four corner turrets, and the prætorium. It is expected that the work will be resumed next summer. Mr. Feasey continues his serial essay on "Curiosities of and in our Ancient Churches," in which he takes up, among other things, the vexed question of low side windows, and sums up briefly all the existing theories, but without specially supporting any one. He also touches on hagioscopes. It is curious that in connexion with this subject we never see any reference to the interesting example of Manorbier church in Pembrokeshire, a church which may be said to be riddled with cross-cuttings of this kind; and what is more to the purpose, on the north side these hagioscope openings are sighted from a low side window, a point which the theorists on the intention of low side windows might find of interest. We may add that the Pembrokeshire churches, in the south at all events, show frequent examples of these oblique openings which are called "hagioscopes;" they are, in fact, quite a characteristic of the district.

The *Engineering Magazine* is more purely engineering than usual, but the article on "Mechanical Transport Appliances" deals with a subject which may be of practical interest to all contractors for work, on a great scale, whether under architects or engineers. "Actual Experience with the Premium Plan" in a large workshop (the Bickford Drill and Tool Co., Cincinnati) gives a curious insight into the suspicion of the typical artisan in regard to any new system of payment, even when it is demonstrated that it is a pecuniary gain to him and has been devised primarily for his benefit.

The *Art Journal* includes an article by Mr. Claude Phillips on "What the Brush Cannot Paint," a tolerably large subject! on which painters will not all be in agreement. One would have thought that among such subjects was to be reckoned dew-drenched furze under the morning sun; yet Millais managed to make a painting of it that at least was not a failure as paintings go. We do not know that there is much profit to be got by the consideration of the subject, but it is a pleasant one to write about. The number includes a short article on "Electric Lighting," of course from the artistic point of view, introducing illustrations of several fairly good trade designs for brackets and lamp-stands, but no artists' work.

The *Studio* (December 15) contains illustrated articles on the works of Alfred Sisley and Wilhelm Leibl.

The *Artist* includes among its contents an article on "Point and Pillow Laces" by Mr. W. G. Boudoin, with some most fascinating illustrations.

The *Century* contains, in its series of "Cole's Old English Masters," a short article on Sir Thos. Lawrence, by Mr. C. Van Dyke, which is rather a good set-off against the exaggerated importance which French critics have lately attached to Lawrence's work. M. Van Dyke's estimate of him is much more reasonable and more sound in a critical sense. Mr. Cole's engraving after the picture of "The Two Sisters" is admirable. The colour-printed illustrations to the article on "New Antarctic Discoveries" are very effective and are worth giving as suggestions to help the imagination to realise the effects of light in those sub-polar regions, but of course they should be taken as suggestions only, so far as the resources of colour-printing allow.

In *Scribner* Mr. Jesse Williams, under the title "The Walk up Town in New York," gives a description with pen and photographs of some of the features of New York streets. Under the heading "The Field of Art" is a rather good little essay "On Portrait Art, by a Portrait Painter," some of the remarks in which have a bearing on the modern theory of painting the impression, or the "mind," of the sitter, instead of being content with letting the facts of his physiognomy speak for themselves in the portrait.

"All we see in men is light and shadow and colour. We do not even see form, still less anything beneath it. Painting the soul is only imitating the external manifestations of it as displayed in muscular action. Character is to be found in a hand or movement, as well as in a head. It is well-known that detectives agree that the most difficult part for a man to disguise is his back. Impressionism has done some good in confining the artist to the representation of that which he sees. All departures from that are dangerous. The painter who paints the pupil of the eye in a face twenty feet away, paints what he knows, not what he sees, and is untrue to nature. Old Denner, in representing the hairs and pores of the skin, was far from correct. Those are to be discovered by the magnifying-glass, not by the eye.

Let the artist train himself to paint what he sees, and resist the temptation to add or to take away."

The *Asiatic Quarterly Review*, which seldom deals with any archæological subject (though we should imagine its title gave ample scope for such), includes an article on "The Château de Ramezay at Montreal"; concerning which, on the other hand, one does not see how Montreal comes into the field of a professedly "Asiatic" periodical. The article is mainly historical in the usual sense—*i.e.*, dealing with the history and doings of men, but there are some details about the house. The Château of Ramezay was used for various governmental purposes since the union of Upper and Lower Canada in 1841. Some of the vaults had formerly been used as dungeons or for storing food supplies in the days when the raids of the Iroquois rendered cultivation almost impossible.

"Under the English Governors, these vaults were used as wine-cellars, servants' offices, and quarters for the Governor's guard, for the preservation of the old French and English official and other records, and for the storage of fuel and supplies. In one vault we still find the kitchen. The huge fireplace was fitted up above with an arrangement for smoking ham and bacon, while on one side opened a large oven, about 5 ft. in diameter, for baking bread. In a recess close by was hung a drum, in which worked, like a squirrel in a cage, the turnspit-dog that roasted the joints. In the corner of another vault still lies a portion of the first system of water-pipes used in Montreal. It is the trunk of a tree, 10 ft. or 12 ft. long, by 9 in. or 10 in. in diameter, hollowed out. The walls of the vaults are in some places of great thickness, ranging from 5 ft. to 8 ft. In the early part of the eighteenth century, when a good house was built, it was solidly built. It is stated that some fifty years ago, soon after the château ceased to be the residence of the Governors, the City Council authorised the demolition of a portion of it, in order to open up a thoroughfare. The building

was thus cut in two. The portion which is now used as the museum was retained by the civic authorities. The remainder was turned into a hotel. . . . . When, in 1893, the Provincial Government offered it for sale by public auction, it was bought by the Corporation of the City of Montreal with the view of preserving the building and establishing in it a free public archæological, scientific, and historical museum. In 1895 the custody of the château, on behalf of the people of the city, was vested in the Numismatic and Antiquarian Society."

The *Pall Mall Magazine* contains an article on "Morocco, the Imperial City," not, however, of much interest in an architectural sense, and one on "Notable Houses in South Africa," the illustrations to which give an idea of the local style of house architecture, which is rather interesting, and of which we may give some illustrations on a larger scale presently.

The *English Illustrated Magazine* includes a short article on "Stonehenge," with illustrations; of course only of popular interest.

The *Gentleman's Magazine* includes an article on "Light, Electricity, and the Ether," by Mr. J. Ellard Gore, chiefly concerned with Professor Wood's theory of the constitution of the æther.

The *Home Counties Magazine* contains an article on the church and rectory of St. Michael Bassishaw, by Mr. W. B. Passmore, with an illustration of the interior of the church, and one on the Priory of Holy Trinity, or Christ Church, Aldgate, by Mr. W. R. Lethaby, with reproductions of some old plans and an old engraving, in the possession of the Marquis of Salisbury, which are of real value.

Knowledge has an article on the grave subject of "Explosions in Coal Mines," and Mr. E. Walter Maunder contributes the first of a series of articles on "Astronomy Without a Telescope"; Mr. A. Fowler writes on "The Constituents of the Sun"; and the unsolvable but fascinating question, "Is the Stellar Universe Finite?" again gives rise to some interesting correspondence. One of the correspondents, Mr. W. Anderson, who writes from Madeira, sums it up thus—that though the stellar universe may be infinite, the visible portion must be finite, and that "no reasoning, from numerical data or otherwise, can ever advance us a step further." Therefore, he adds, the question should not be, "Is the stellar universe finite?" but—"Is it probable that, within the finite visible universe stars are uniformily distributed?" This is logic and common sense; but alas! how sadly less fascinating than the other form of question.

The *Quarry and Builders' Merchant* commences a series of articles on "Cranes and other Lifting and Transporting Machinery," by Mr. E. C. R. Marks, A.M.Inst.C.E.

We have received also *Harper's Magazine* (a very interesting number, but which, for once, contains nothing within our province), the *Genealogical Magazine*, the *Indian Engineer*, the *Architect's and Builder's Magazine* (New York) and *Fifty Years of Art* (No. 12), being the Jubilee series of extra numbers of the *Art Journal*.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

AT the fifth general meeting (business) of the session 1899-1900 of this Institute, held on Monday at No. 9, Conduit-street, Regent-street, W., the President, Mr. Wm. Emerson, in the chair, the minutes of the last meeting were taken as read.

The decease was announced of Francis T. Dollman, retired Fellow; R. Reynolds Rowe and W. W. Wardell, Fellows; and Paul Sédille, Hon. Corr. Member (Paris).

The Hon. Secretary, Mr. Alex. Graham, drew attention to a number of works, laid upon the table, which the Library had recently acquired, some by donation and others by purchase, and, having specified the more noteworthy among them, moved a vote of thanks to the donors, which was carried by acclamation.

The following candidates for membership were elected by show of hands, under By-law 9:—*As Fellows.*—H. Baker, Cape Town; F. G. Biggs, Blackburn; J. Murray; and H. V. Wolstenholme, Blackburn.

The meeting having discussed various questions connected with the position of Associates, especially in respect to representations made to the Council by a deputation from a Committee of Associates, the President stated that the suggestions which had been received would be considered by the Council, who would at an early date submit proposals resulting therefrom to the general body.

The Chairman announced that the next meeting would be held on the 22nd inst., when the award of prizes and studentships would be announced, and Mr. Basil Champneys would read a paper on "The John Rylands Memorial Library, Manchester."

He also announced that the annual exhibition of designs and drawings submitted for prizes and studentships would be held this year at the Gallery of the Alpine Club. The exhibition would open on Tuesday, January 16, and close on the 27th. The entrance to the Gallery is in Mill-street, Conduit-street. Hours, 10 a.m. to 8 p.m. Visitors admitted on presentation of their card.

ARCHITECTURAL ASSOCIATION DISCUSSION SECTION.

THE fifth meeting of the Discussion Section of the Architectural Association for this session was held at 56, Great Marlborough-street, W., on the 5th inst., Mr. C. H. Strange, Vice-Chairman, presiding. Mr. Vivian H. King read a paper on "The Public Monuments of London Architecturally Considered," of which the following is a summary:—

Mr. King, for the purpose of the lecture, defined a monument "as any erection (other than a complete building) intended as a memorial of certain persons or events," excluding from this general body strictly sepulchral memorials, as needing a widely different treatment. To obtain the best results with decorative monuments it was essential that there should be co-operation between the sculptor and the architect, so that the entire design should form one united whole.

The earliest existing monument in London was "The Monument," erected after the Great Fire of 1666 (the Elenor Cross being only a modern reproduction). Up to the beginning of the present century monuments were almost entirely confined to statues of the Royal Family. It would seem that monumental design should, to be successful, be based on the following axioms:—

1. Any erection is intended to endure, to carry on the remembrance of the person or event to whom or which it is dedicated, hence all material used must be of a lasting character, and not affected by the climate.

2. The general massing and outline of any composition should produce a strong impression of stability upon the mind of the observer.

3. The design should also produce a restful effect, and any frittering away of this calmness by superabundant small ornament is to be condemned.

4. The treatment of the sculpture should be suitable to the material and purpose. Momentary poses are distressing when placed in juxtaposition with the more or less severe lines of a building or pedestal. Any position which could not be naturally maintained for a lengthened time, such as that of a prancing horse, wearies the spectator. The custom of investing British statesmen with the Roman toga and similar vagaries was now very much a matter of the past, for which we must be grateful, as indicating progress in the right direction.

The question of adding colour to detached statues had often been tried, but never satisfactorily, apparently for the reason that the addition of colour in part detracts from the spectator's appreciation of pure form, and a naturalistically coloured statue approaches too near to mere imitation, and as such fails on comparison with the living subject. Judging existing monuments by the axioms laid down above, they seemed to fail almost entirely on one or more of the points indicated. Mr. King then proceeded to examine in detail, with the aid of lantern slides, many of the monuments of London, pointing out many of their defects, and suggesting means which might have been adopted to have given better results.

The discussion was opened by Mr. E. Greenop, who moved a vote of thanks to the author of the paper, and advocated the use of busts in preference to the full-sized figures in modern dress.

Mr. Garbutt favoured the use of modern costume, and considered that in many cases where the attempt was made to decorate the pedestal, the statue itself did not receive so much attention.—Mr. Weymouth referred to the Gordon monument in Trafalgar-square, which he considered too elaborate and delicate in detail for the severe treatment of the square. The discussion was continued by Messrs. Brodie, C. Smith, Dawson, Tayler, Satchell, and the Chairman.

Mr. H. H. Statham, Special Visitor, summed up the discussion, and called attention to the disadvantage of momentary poses on monuments. He also mentioned that originally the Monument of the Fire of London was intended to have flames of fire issuing from the windows in the shaft as a perpetual reminder of the cause of its erection. Mr. Statham described some of the best French memorials, and illustrated his remarks with some lithographs, which were handed round.

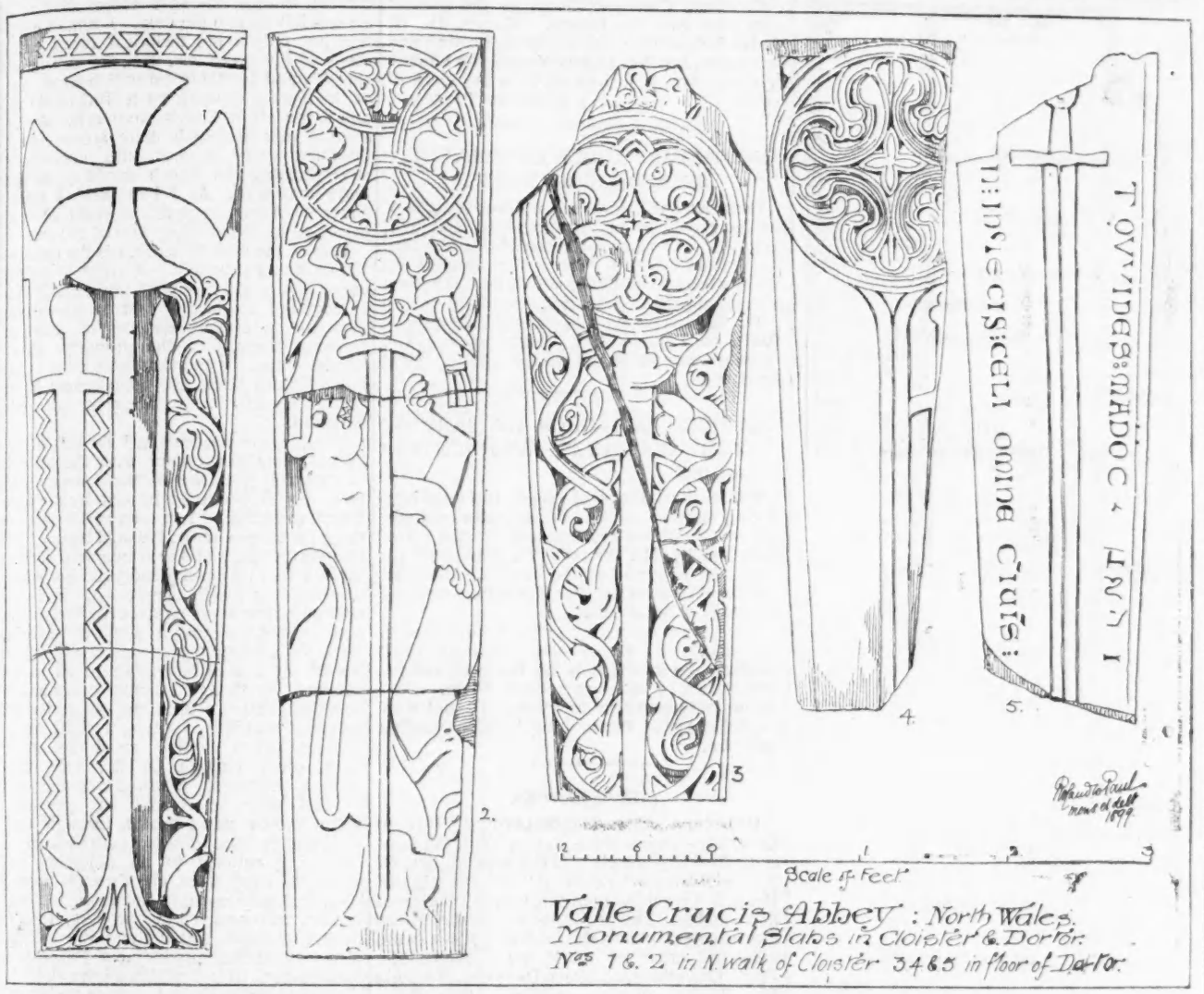
Pedestals required a modelled treatment in harmony with the lines of the sculpture, as seen in some of the best modern French examples, and in the Charles I. monument at Charing Cross and the pedestal of the Gordon monument in Trafalgar-square. He was opposed to modern costume in memorial statues, and thought the French had shown the best treatment in giving the portrait bust only, as was frequently done, and making up the composition with allegorical figures, or with ornament, as in the Clairon monument by M. Gauquié, which was a model of this type of monument.

Mr. F. W. Pomeroy, Special Visitor, gave some favourable positions for monuments in London, especially mentioning the Thames Embankment as an excellent site. He advocated the union of the architect with the sculptor in designing monuments.

A hearty vote of thanks was accorded to the author for his paper, to the Special Visitors, and to Mr. F. J. O. Smith for working the lantern, which added greatly to the interest in the subject.

ARCHITECTURAL SOCIETIES.

SHEFFIELD SOCIETY OF ARCHITECTS.—The ordinary monthly meeting of the Sheffield Society of Architects and Surveyors was held on Tuesday at the School of Art. Mr. J. Smith (President) was in the chair. A ballot was taken, and Messrs. A. G. Cotton and H. T. Raper were elected Associates of the Society. On the motion of the President it was unanimously decided to send a letter of sympathy to the family of the late Mr. J. D. Leader, F.S.A., who was an hon. member of the Society. It was also decided to send a similar letter to the family of the late Mr. J. Spink, who was secretary of the Sheffield Master Builders' Association. It was announced that the Council was dealing with the clauses of the Sheffield Corporation Bill, and would be glad to receive communications from members of the Society on the matter. Mr. W. Emden, L.C.C., then read a paper, which we print on another page, on the question of "Ancient Lights." In the discussion which followed, Mr. E. Holmes, who proposed a vote of thanks to the lecturer, said that most of them would agree with Mr. Emden in what he said about the serious abuses of the present state of things. He was in favour of some such tribunal as was suggested, but was jealous about giving more power to municipal corporations. Mr. E. M. Gibbs seconded the motion.—Mr. Wightman, in supporting, remarked that he had never seen such a thing as a grant of light and air; so far as his experience went, such rights were stolen. If the law could be altered so that a man could build as high as he chose upon his own land, subject, of course, to the usual municipal regulations, that would put an end to a great many difficulties.—Mr. W. C. Fenton expressed sympathy with the views of the lecturer.—Mr. Joseph Binney said he agreed with Mr. Wightman's remark that rights of light and air were acquired surreptitiously—in many cases they were stolen. A window was put out, and nobody paid any attention to it, and it was not, perhaps, very much good until, it might be, years after, when the property adjoining was altered, and then the ancient light shone out in all its glory. The only doubt he had was with regard to the tribunal; he was afraid they would not have very much confidence in a tribunal such as was suggested. It would not be the collective wisdom of the Corporation they would get, but the work would be relegated to a committee, and very likely to a sub-committee.—The Chairman said the point upon which they were all agreed was that something in the nature of reform ought to be carried out. If they could only hope that the Legislature would



Valle Crucis Abbey: North Wales.
Monumental Slabs in Cloister & Dortor.
Nos 1 & 2 in N. walk of Cloister 3 & 5 in floor of Dortor.

adopt the suggestion of Mr. Wightman, and pass an Act that would be retrospective, so that all property would come under its influence, that would indeed be a drastic remedy. He was afraid, however, the Legislature were too much wedded to vested interests to take such a step as that. He fancied that the reason why Mr. Emden had suggested the establishment of a court under the Corporation was in order that the plans usually submitted to the Corporation might serve both purposes. Inasmuch as the interests of the Corporation and those of building owners were often in conflict, he thought the Corporation could not be expected to be sufficiently disinterested to form a proper court. He did not see why they should not have a court composed of architects, surveyors, builders, and solicitors, with power to call upon the Corporation for use of the plans deposited with them.—Mr. Emden, replying to the discussion, said he did not suggest that the Corporation should have anything to do with the matter further than appointing permanently the officers who were to deal with it. If the appointments were permanent, he thought they would get good and honourable men. The constitution of the court ought to be local, and he did not see how any one but the Corporation could very well make the selection. The Corporation afterwards would have to abide by the decisions of the court, as well as anybody else. The present state of things with regard to questions of light and air was absurd.

ARCHITECTURAL ASSOCIATION OF IRELAND.—On the 9th inst. an ordinary meeting of this Association was held, at which Mr. M. Glover read a paper on "Temples and Temple Builders." Touching first on the religious cults of the early Egyptians, Mr. Glover pointed out that their religion was altogether a worship of nature and its forces, and that all the Osiric and other legends were chiefly sun, moon, and star myths. All the peculiarities of Egyptian temples may be attributed to the exigencies of the cult. A large number of slides were shown illustrating the various forms of temples in India, Egypt, Mexico, Peru, Greece, and Rome, and the marked resemblance between the Hindu and South American styles was pointed out. After some supplementary remarks by Mr. Molloy, a vote of thanks was proposed to Mr. Glover for his able and interesting address, and was carried unanimously.

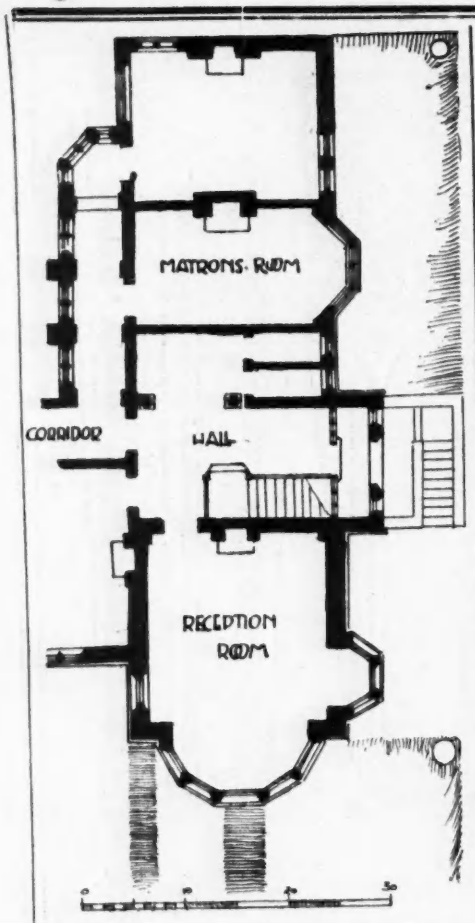
MONUMENTAL SLABS, VALLE CRUCIS ABBEY.

AN account of the Cistercian Abbey of Valle Crucis, near Llangollen, appeared in the *Builder*, July 1 of last year, and attention was drawn to the interesting examples of gravestones remaining in various parts of the ruins, illustrations, at the same time, being given of one or two of them.

In the north walk of the cloister are two gravestones of early date, both with early forms of crosses in low-relief at the upper end. In one example a sword and spear flank the shaft of the cross; in the other, a sword takes the central place, and the remainder of the slab is filled with a leopard or lion, and two conventionally treated birds. (See Nos. 1 and 2.)

South of the chapter house, in the east walk of the cloister, is a slype, the dortor extending over both. The filling in of the vaulting of the slype is largely made up of gravestones, and the worked faces of three are at present visible in the floor of the dortor. These are numbered 3, 4, and 5 in the illustration. The last is the only one bearing an inscription. The name "Madoc" appears among the few words that are still legible. In the centre is a sword. The slab No. 4 is only fragmentary, with a floriated cross in a circle, and the remains of a sword on one side of the shaft. The remaining stone, No. 3, must, when perfect, have been a very beautiful piece of design. It bears strong evidence of Celtic influence, and on either side of the sword which forms the central feature below the cross is a flowing pattern of conventional foliage and what appears to be two snakes. The whole design has, however, suffered much from exposure, and very careful examination was necessary to make out as much of it as appears in the illustration.

Within the past few days a photograph of two other gravestones recently discovered "in the old monks' burial ground near the cloister," has been sent to us by Mr. Darlington, of Llangollen, and a careful tracing of this photograph is here given. The stone on the left bears some resemblance to one now in the dortor (forming the lintel of a fireplace) illustrated in the *Builder* of July 1, 1899. The other, plainer in design and of earlier date, has remains of an inscription, of which the letters seem to be S T W R : U G (or O). During some recent excavations on the south side of the cloister court, some interesting discoveries have been made, including three basins supplied with water by a mineral spring.



North-East Angle of College, Scarborough. Plan.

Illustrations.

HOUSE AT PANGBOURNE.

THE south or garden front of this house, of which other parts have already been illustrated and the plan published, shows the setting out of the terrace and steps leading to the garden. The house being on the slope of a hill, the garden is divided into three levels, which this terrace overlooks.

The house is of red brick and stone, with green slates to the main roof, and the projecting porches, which contain bath-rooms on the first-floor level, are covered with copper. The tower in the rear is not shown on this drawing, and the cupola has not been carried out.

The architect is Mr. John Belcher, and the drawing was exhibited last year at the Royal Academy.

THE ASTLEY CHEETHAM PUBLIC LIBRARY, STALYBRIDGE.

THIS building, now nearly completed, is a gift to the town of Stalybridge from Mr. J. F. Cheetham.

The general arrangement of the rooms is shown on the small key-plan of the ground floor. There is a lecture-room on the first floor, over the front portion of the building. In the basement, besides the heating apparatus, are storerooms for books, and workrooms.

Outside, the building is mainly stone, the dressings of warm colour harmonising with the deep red of the bricks, as well as with the general wall surface, which, up to the first floor, is of stone of a greyer tone. Above the first floor the walls are faced with Accrington bricks, and the roofs are covered with brindled purple tiles.

The central hall is top-lighted, and is surrounded by ten pillars and arches of red terra-cotta.

The general joiners' work is of pitch pine, prettily figured wood being picked out for the panels. The main doors and principal fittings are oak.

The new post-office, designed in H.M. Office of Works, is also shown in the perspective view. The building is now in progress. The architect has kindly made the general features to conform with the library, employing much the same material outside, so that the library and post-office group as one building.

Mr. Isaac Gould, of Leeds, is the general contractor for the library. Messrs. G. N. Haden & Sons have carried out the heating and ventilation, and Mr. Lomax Kendal the electric lighting. Mr. J. J. Lancefield is the clerk of works.

J. MEDLAND TAYLOR.

NORTH-EAST ANGLE OF COLLEGE, SCARBOROUGH, YORKS.

THIS tower will form the north-east angle of the new college at Scarborough, and will command fine views over the North Sea and the Yorkshire wolds. The materials used are red bricks and Whitby stone. There is to be a sculptured panel by Mr. Henry C. Fehr.

The architects are Messrs. Hall, Cooper, & Davis, of London and Scarborough. The drawing was exhibited at last year's Royal Academy.

MEASURED DRAWINGS OF PART OF THE CLOISTERS, WESTMINSTER ABBEY.

THESE illustrations of one of the most interesting corners of the Westminster cloisters are reduced from the fine and careful set of drawings by Mr. Francis W. Newman, for which he obtained, at the close of last year, the Royal Academy Silver Medal for measured drawings of architecture.

The inner elevation shows the curious discrepancy of styles and dates exhibited between the monuments on the wall and the architecture which surrounds them. The author has given also an interesting and very careful study of the vaulting both in elevation and plan.

COMPETITIONS.

DUMFRIES AND MAXWELLTOWN PUBLIC LIBRARY.—There were lodged with the joint councils thirty-one plans in this competition. Of these eight were "measured," and the plan of Mr. A. B. Crombie, Dumfries, was selected from that number. The professional assessor, before measurement, placed the following plans in the following order of merit, viz.:—First: Mr. Frank Carruthers, architect, Dumfries. Second: Mr. Rupert Savage, architect, City Press Chambers, 148, Aldersgate-street, London. Third: Mr. James Crombie, architect, 25, Ramsay-road, Brixton, London. Fourth: Mr. Allan B. Crombie, architect, Dumfries. Fifth: Mr. James Chalmers, architect, Central Buildings, 93, Hope-street, Glasgow. Sixth: Messrs. A. B. Robb and F. G. Grierson, architects, Imperial Buildings, Ludgate Circus, London. The joint councils committee added the following, viz.: Mr. John A. Campbell, architect, 44, West George-street, Glasgow, and Mr. Thomas Martin, architect, Leeds.

THE LAW AS TO LIGHT AND AIR IN BUILDING CASES.

THIS was the title of an address delivered on Tuesday before the Sheffield Society of Architects by Mr. Walter Emden, L.C.C. After some preliminary observations, the author said:—

"It is my desire, in the course of this paper, to show how great the necessity for alteration in the law is; and I trust also to show the remedy, and that it would not affect the rights of property. It is possible that an alteration of the law in the direction of simplification, and a quick settlement of actions, would reduce the expenses for professional advice which owners have to obtain in bringing and defending this class of action; but I feel assured that no professional man of standing, either in the legal profession, the architectural profession, or the surveyors, would desire such a consideration to stand in the way of a change which would be beneficial and would avoid delays, and be the means of saving useless expense to his clients.

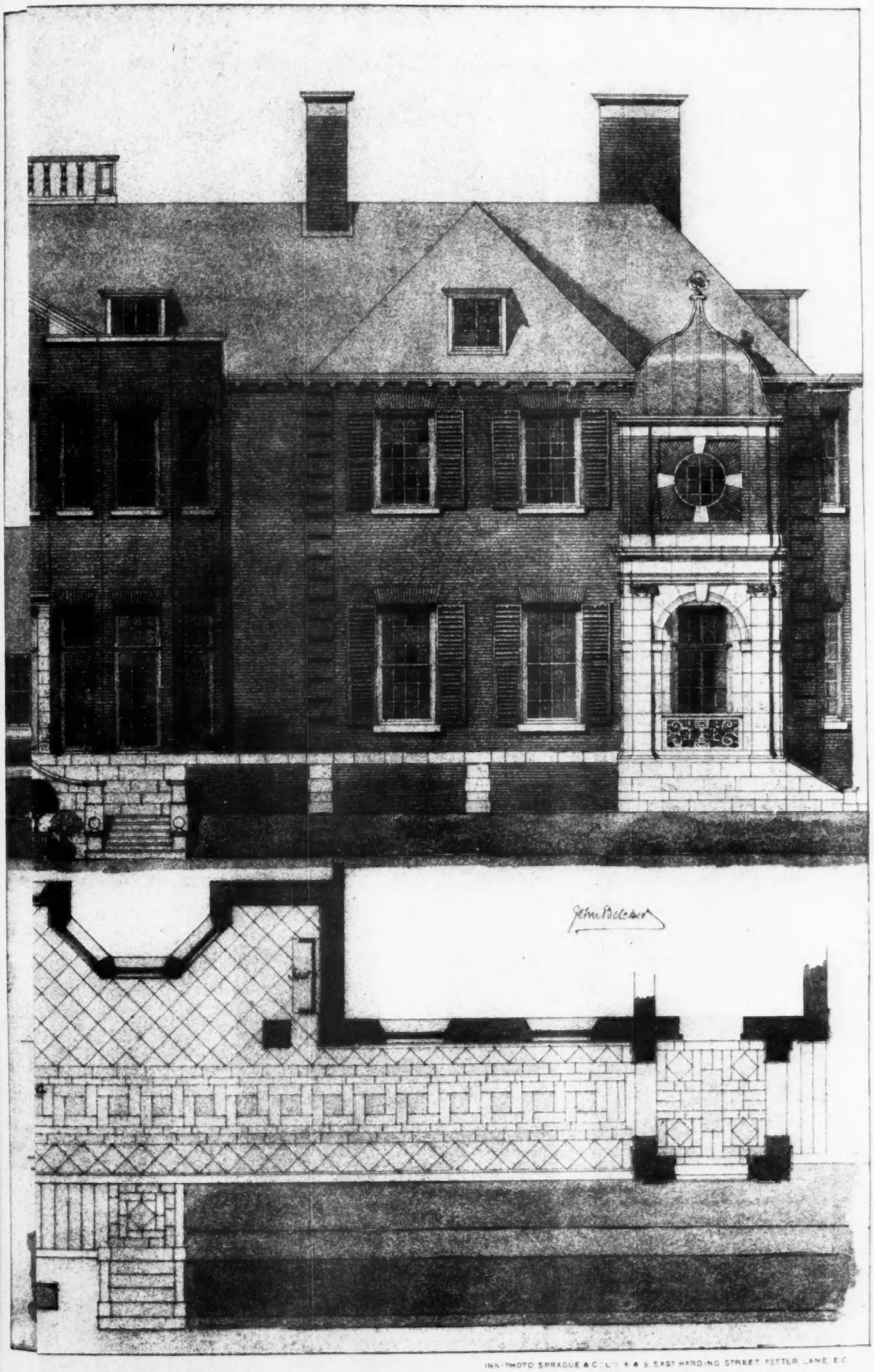
With regard to those gentlemen who have no consideration of this kind for their clients, I think I need not trouble myself. It is for the prevention of the abuse (the very great and serious abuse there can be and is under the present law, for purposes which are not legitimate), that we desire to see improved out of existence the present costly and evil system . . .

There has been considerable attention drawn to the want of High Court Judges to dispose of the actions brought during the current sittings, so that there shall not be arrears left over to the next. I am of opinion that not only could technical cases, such as cases of light and air, &c., be settled more speedily and equitably but with a small portion of the present expense by a Technical Court; and if the High Courts were relieved of this class of case (of which there are considerable numbers every sitting), the necessity for strengthening the Bench would probably be done away with. As I have said, I desire to show, what from a practical point of view is the effect of the existing state of the law.

One of the first difficulties is the question of the rights of property. A right to light and air or any other easement, under English law is acquired by having had an uninterrupted user for a certain number of years, and becomes a right of the property. Now in Scotland, and on the Continent where Roman law prevails, these questions cannot be made the means of black-mailing as they are in England.

Now, let me at once say, I do not intend to propose any interference with the acquisition of rights such as are obtained under English law. No right would be lost by the remedy I have suggested. In many, and in fact a very large number of cases, it would be much better to describe many of these acquired rights as a theft of that which rightfully did not belong to the property which acquires it. The present state of the law assumes that everybody knows it, and understands that if a gutter be overhung on to the adjoining premises, if a floor be supported on a wall belonging to an adjoining owner (even though he may never have seen or known that the floor was so supported) for a certain number of years, a right will have been acquired which must be reckoned with, often enough to the tune of very serious amounts, when an owner wishes to deal with or rebuild his property. I have known cases where, through a party-wall, and in more than one case through a wall belonging entirely to an adjoining owner, windows have been cut through above the roof, not only entirely unknown to the freeholder, who had let the property for a long period of years, but without the consent, as also without the knowledge, of the occupier or leaseholder. A law which allows all this to be done necessarily cannot be very perfect, and it hardly seems to me like a protection of the rights of property; but it is the law, hence its power for evil must be curtailed as far as the law has to be reckoned with.

To follow one of my illustrations a little further—a person whom I will call 'A' owned a house at the corner of the esplanade and a side street in a large seaside town. Some period after, a person whom I will call 'B,' erected a house in the side street adjoining 'A's' property. It was desired many years after by the owner of the corner property to re-erect his premises, carrying them a floor or more higher than they originally were. Provision was made for the light and air of the adjoining owners of the esplanade, but as there was an independent wall belonging to 'A,' between 'A' and 'B's' premises and the lights in the side street look out only to the back and front, no provision was deemed necessary. On pulling down the property it was discovered that a window had been cut through and put in by 'B' between the two hips of 'A,' the building owner's roof; that is, through the independent wall of 'A.' When 'A' proceeded to pull the independent wall down, it was found further that, although 'B' had erected a wall from basement to ceiling of the ground floor, that above that height the wall was omitted, and support taken off the existing independent wall of 'A.' There was no record of any right having been given for either window or support, and, so far as an examination of those who owned the property formerly was concerned, no information could be obtained of any notice having been given. The solicitors, in whose hands the property had been for a great number of years, had no information either that any right or permission had ever been asked or given, or notice received. Yet I take it that the side street owner 'B' was within his right to claim and to prevent the corner owner 'A' raising his building, and he did so, and also claimed and obtained the right to use the independent wall more or less as a party-wall. Now I would ask any common-sense man upon which side, taking these facts as correct, should the right of property lie? Upon which side had the rights of property been protected?



INS. PHOTO SPRAGUE & C° LT° 4 & 5 EAST HARDING STREET FETTER LANE E.C.

LCHER, F.R.I.B.A., ARCHITECT

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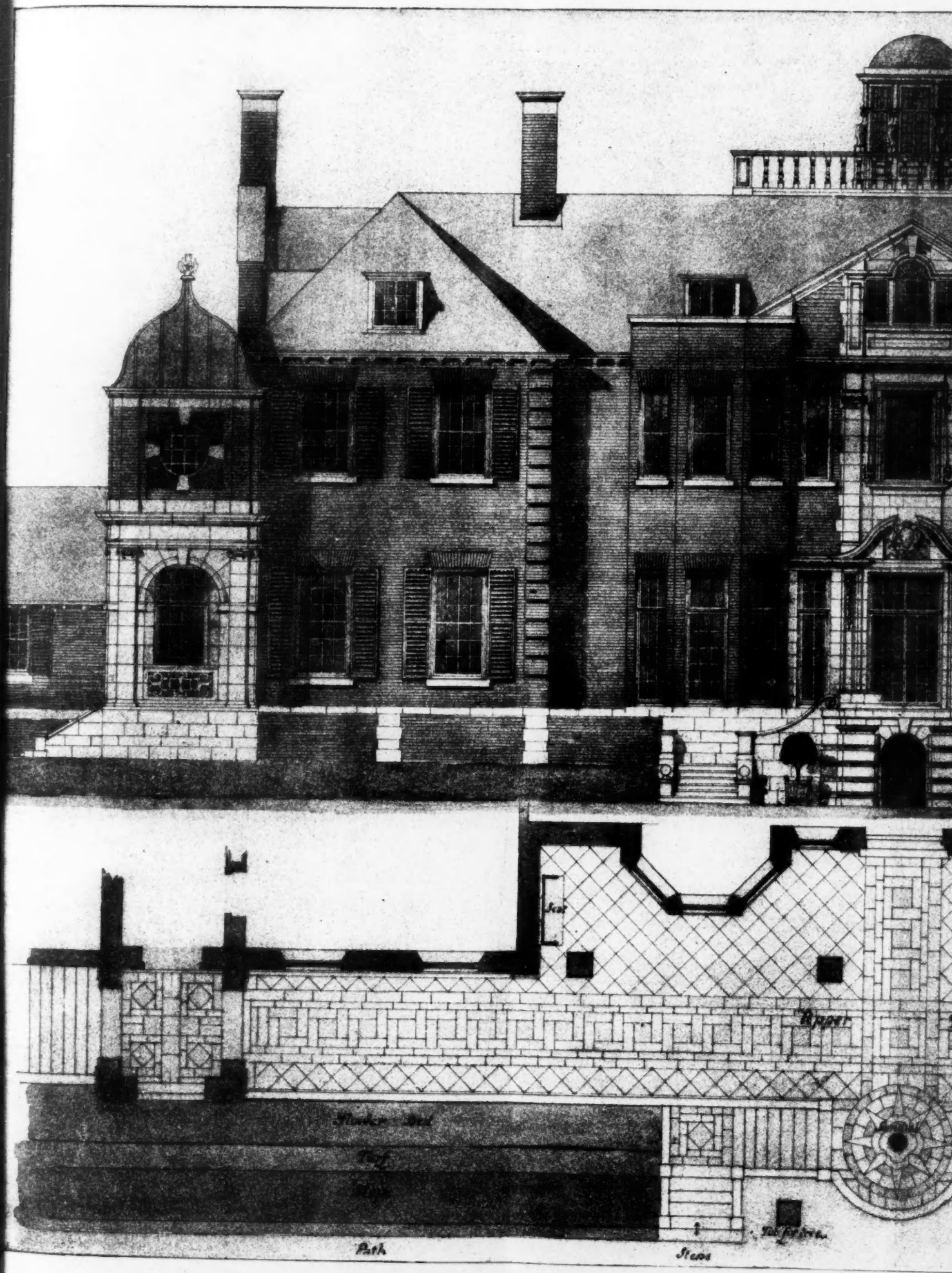
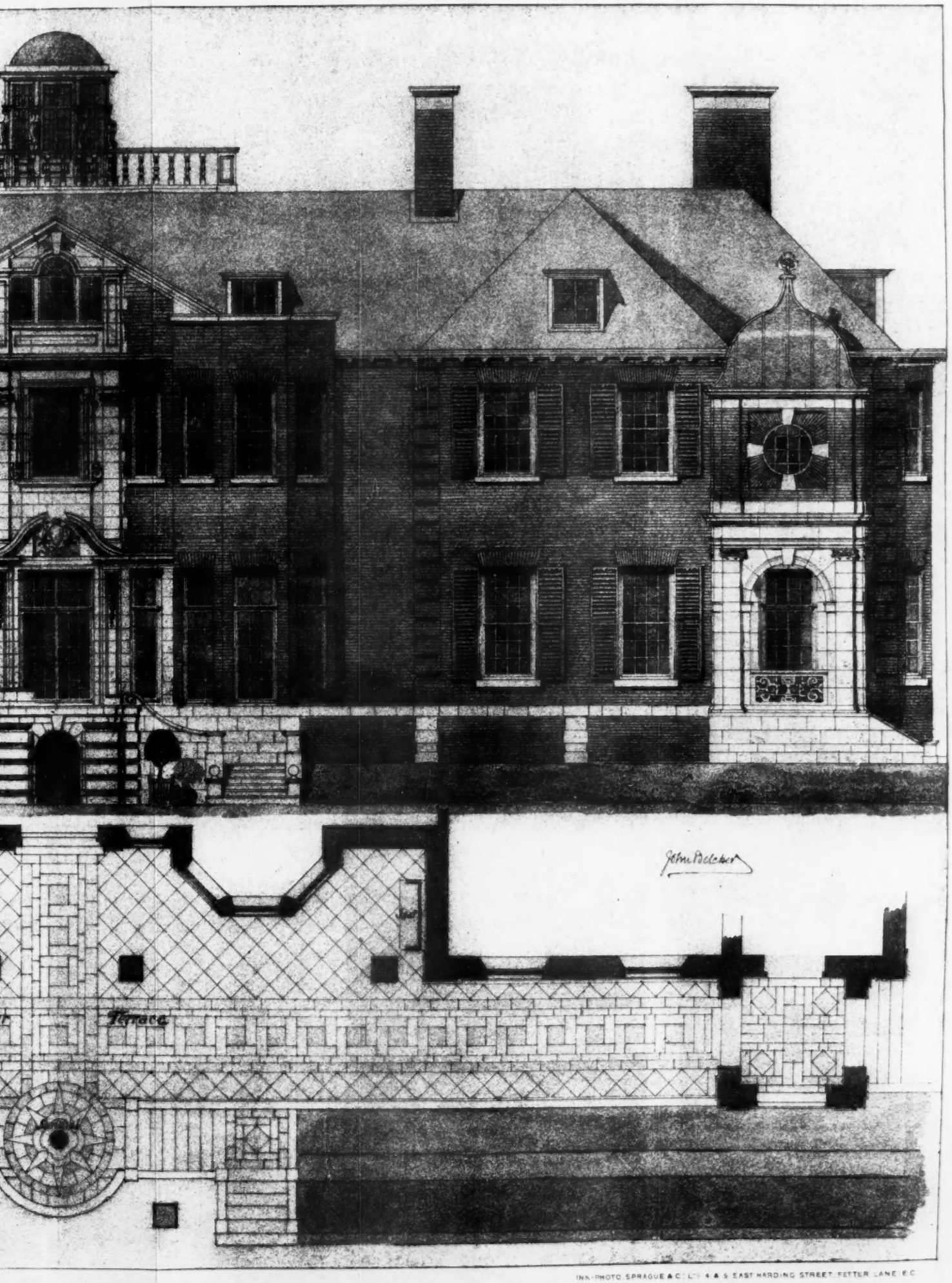


HOUSE AT PANGBOURNE: GARDEN FRONT.—Mr. Jo

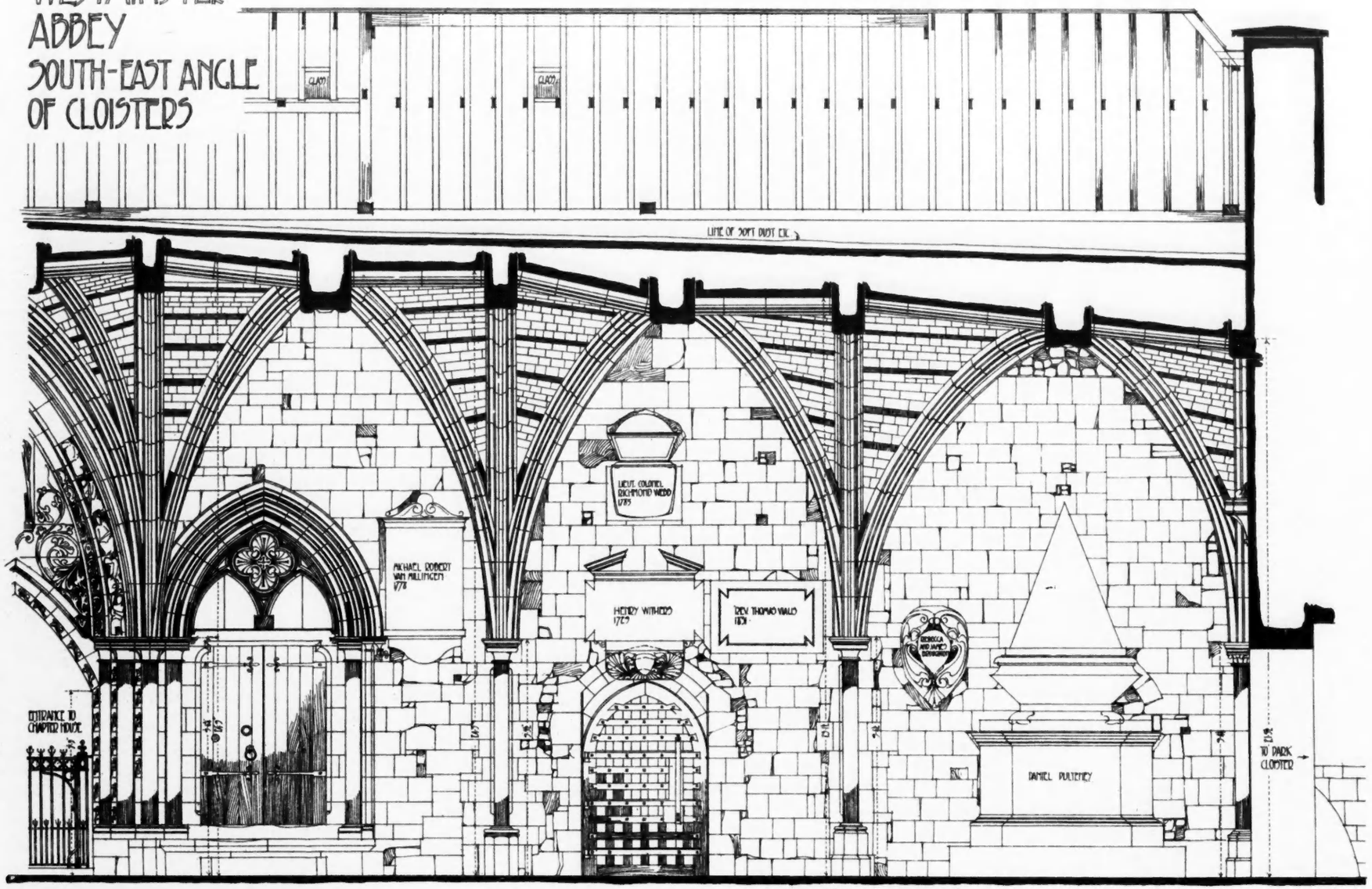


INK-PHOTO SPRAGUE & C° LT° 4 & 5 EAST HARDING STREET, FETTER LANE, E.C.

FRONT.—Mr. John Belcher, F.R.I.B.A., Architect

WESTMINSTER ABBEY

SOUTH-EAST ANGLE OF CLOISTERS



LONG. SECTION LOOKING EAST

NOTE - JOINTING TAKEN FROM ACTUAL MEASUREMENT - SHAFTS, BASES AND CAPS ARE OF PURBECK MARBLE

- SECTION OF IRON GRILL AND GATES OMITTED

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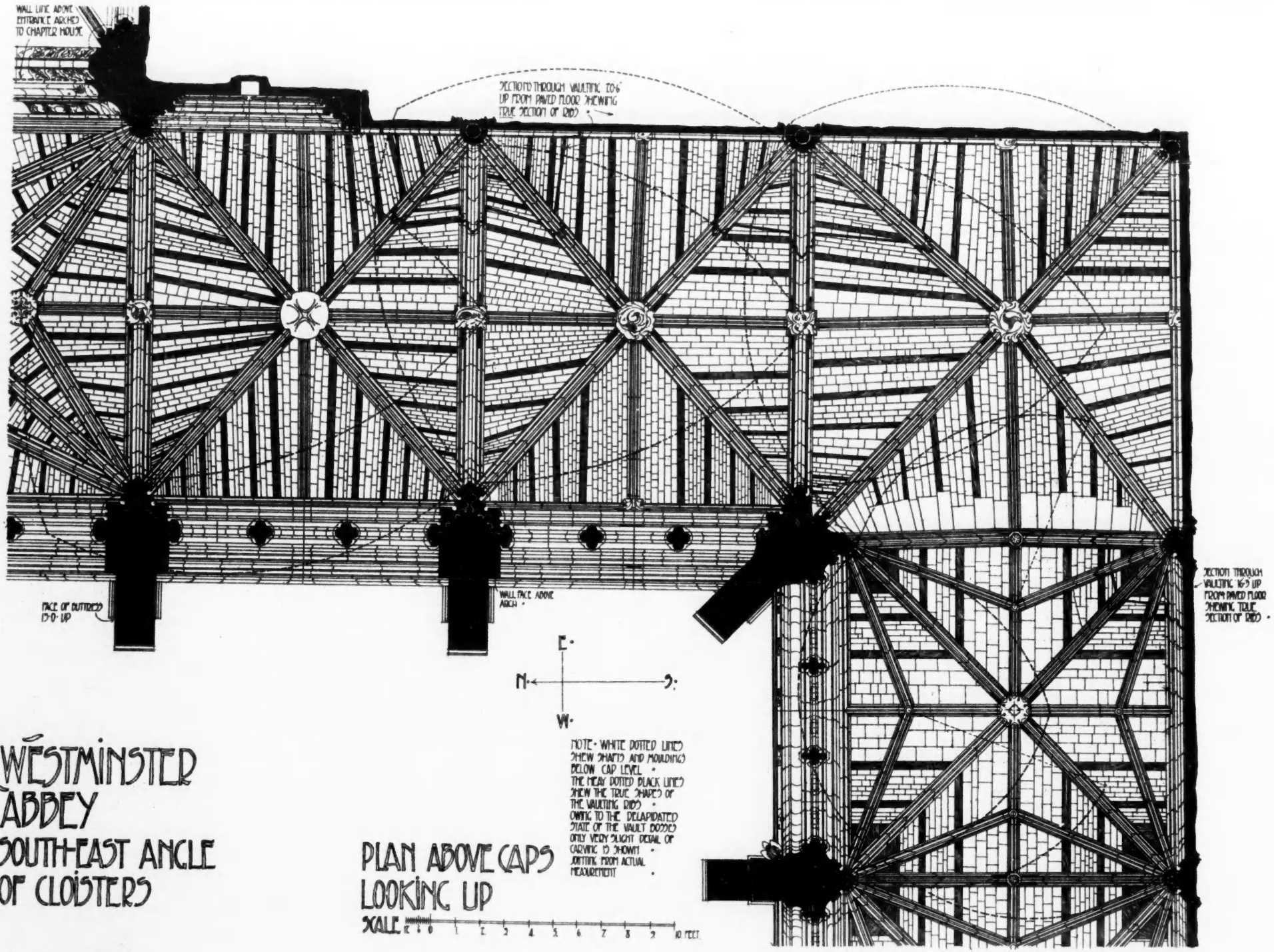
WESTMINSTER ABBEY


WALL LATE ABOVE ENTRANCE ARCHED TO CHAPTER HOUSE
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· WESTMINSTER · ABBEY · SOUTH-EAST ANGLE · OF CLOISTERS

PLAN ABOVE CAPS LOOKING UP

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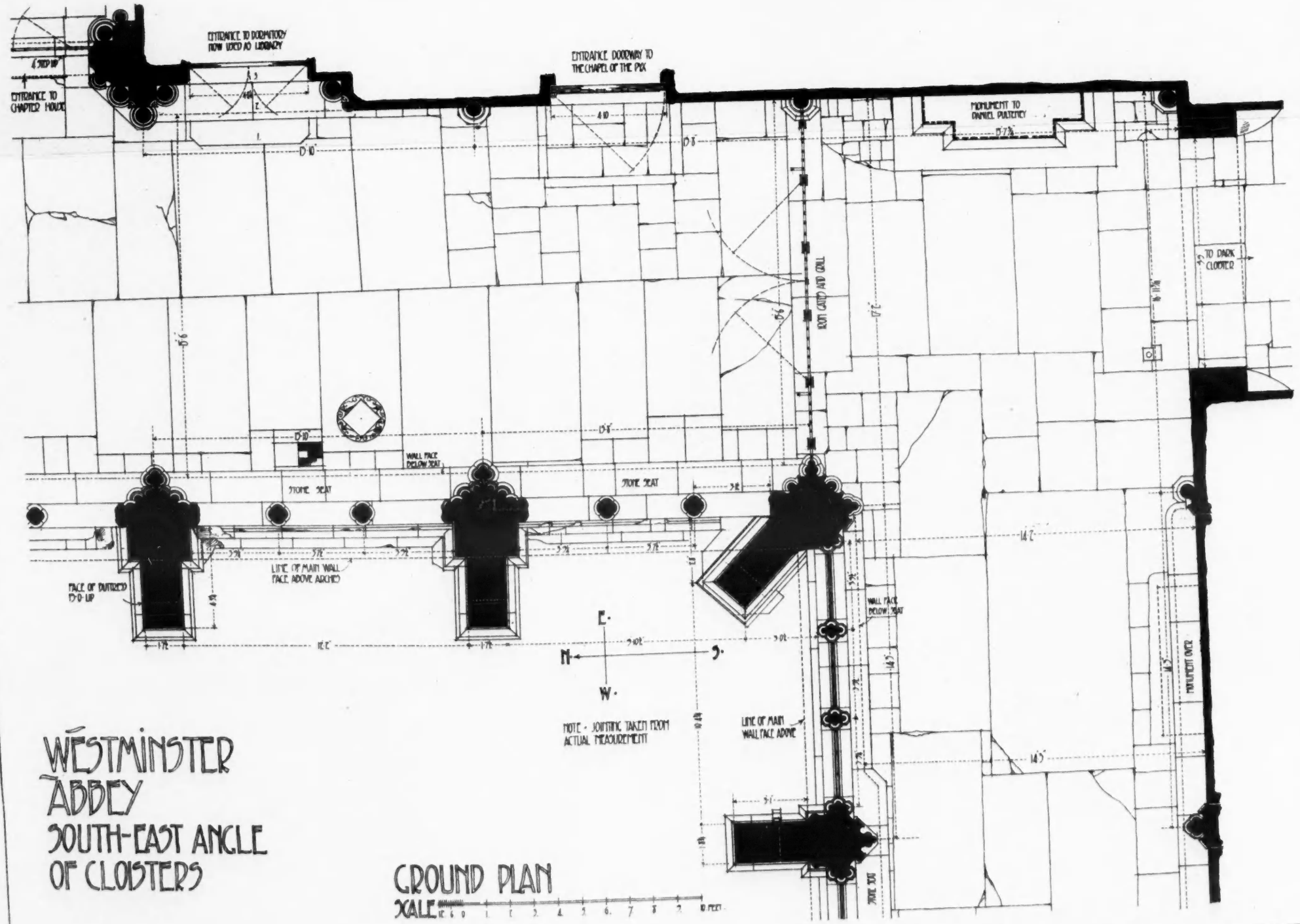
OF CLOISTERS
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WALL FACE BELOW SEAT
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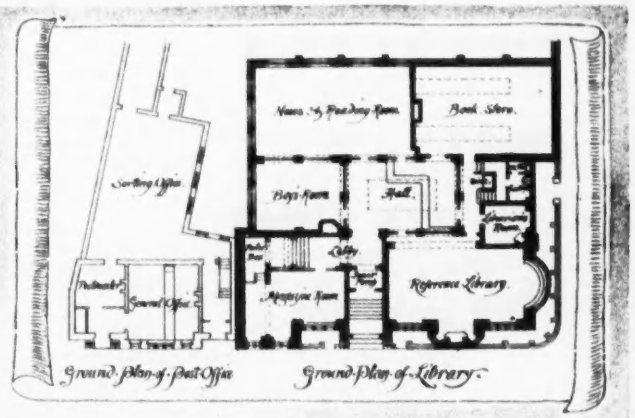
LINE OF MAIN WALL FACE ABOVE
WESTMINSTER ABBEY
SOUTH-EAST ANGLE OF CLOISTERS
GROUND PLAN
SCALE
PHOTO LITHO SPRAGUE & Cº LTD 4 & 5 EAST HARDING STREET FETTER LANE E.C.

MEASURED DRAWINGS OF PORTION OF CLOISTERS, WESTMINSTER ABBEY.—By Mr. Francis W. Newman.

Royal Academy Silver Medal, 1899.

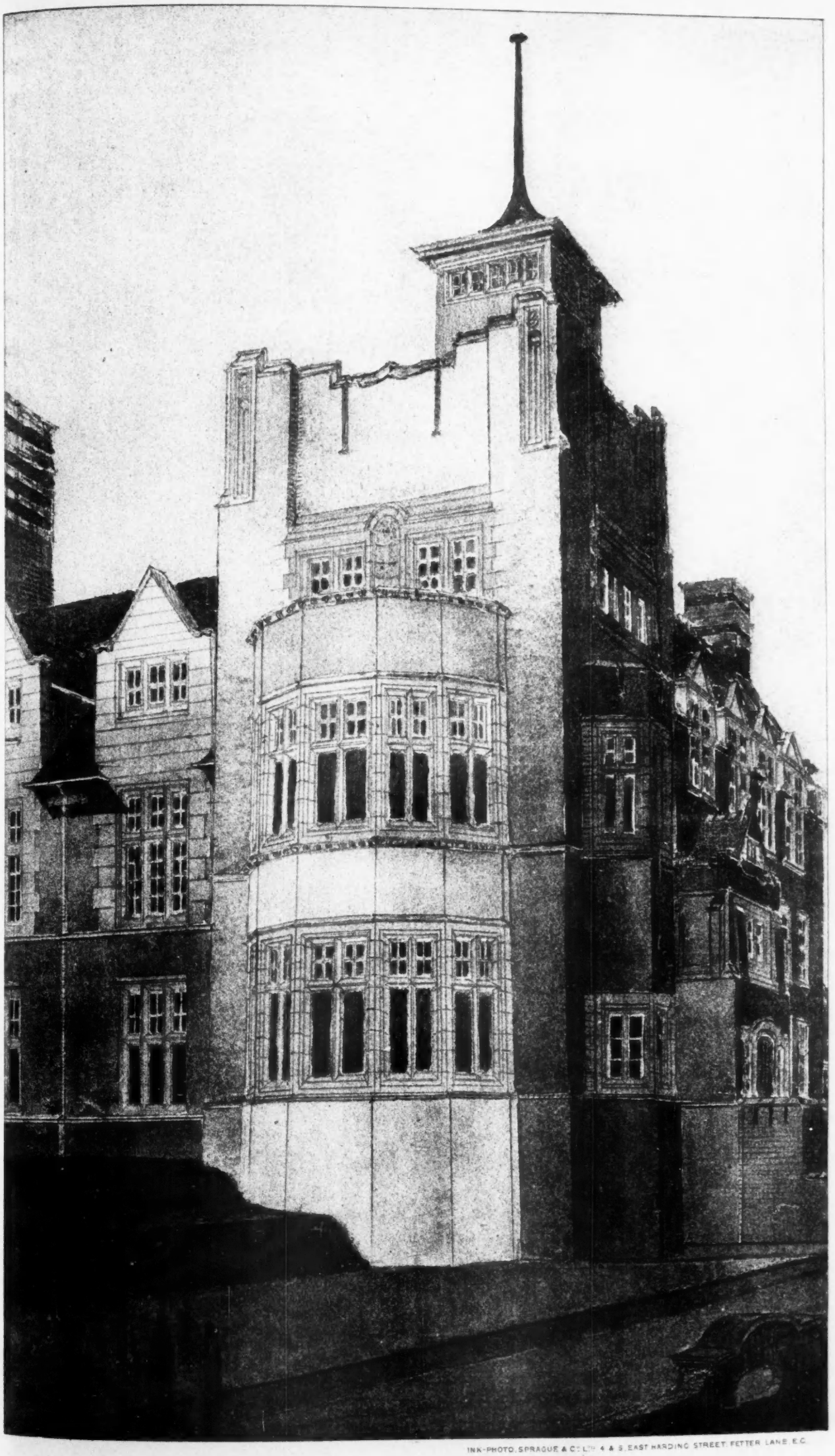
The Astley-Cheetham Library: Stalybridge. 1899.



The Post Office was designed in H.M. Office of Works.

* Medland Taylor : Architect : Manchester :

South-West View.



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NORTH-EAST ANGLE OF NEW COLLEGE, SCARBOROUGH.—Messrs. Hall, Cooper & Davis, Architects

This is not a single case; there are scores of similar cases—I think while this case goes to illustrate my point, their numbers will prove the waste there must be by expensive actions, while the delays there must be when owners attempt to build is almost unlimited. There is hardly a building commenced in which some difficulty as to light and air does not crop up.

I do not, in the remedy, suggest alteration in the manner in which such rights are built up under the law. I hope that the remedy, by preventing wasteful expenditure in law suits, if once brought about, would go a long way to prevent not only many of these infringments being sought after, but their being made a source of blackmail where they exist, and also preventing serious delays to the building owner (which delay is, after all, the main reason why large sums are paid); as to be stayed by an action for injunction is in many cases not only serious but often ruinous. I do not by my argument or this illustration put it forward that there are no legitimate claims of light and air, because there are many; and equally on this side, the interference with rights of owners would be prevented, and no one would be prevented from protecting their rights by the fear that the building owner (who is possibly a wealthy man) will put them to all the expense he can, and at least to the expense of a heavy action. The fact that notice must be given before building is commenced, and that the case would be brought at once before the Technical Court, would, in my opinion—and, I think, in the opinion of most people—go a long way to prevent illegitimate claims on both sides of the question.

I will give you a few instances with which I have become acquainted, and which will still further show in themselves the trivial nature of some claims set up, and also the delay and expense which they can cause. One case in London: An old house had been at some period divided into two, and though the division wall between the two had been carried up right through the house, in the roof no division had been carried through. Both houses had an opening into the roof and each had repaired their own part. The time came when rebuilding operations were set on foot by the owner of one of the houses. After he had partially pulled down, the owner of the other half set up a claim that the space in the roof belonged to him, and therefore the adjoining owner could not go higher and could not remove the roof. In order to prove the right to space in the roof, it was shown on a plan as a workshop, and some small bundles of material used in the trade carried on, on the plaintiff's side, were put into the roof. The height of the centre part of the roof was only about 4 ft. 6 in., and the rest of the roof, sloping down as it did, there was necessarily very little height anywhere. A man could not have stood up to work in any part of the roof, and, in fact, to walk along in the highest part a man had to stoop. The whole space was small and unlighted, and quite impossible as a workshop, nor did it show evidence of its having ever been so used. Still, upon this claim the building was stayed, and although eventually the claim fell to pieces, there were large expenses incurred in fighting the action, and the defendant, by not being able to go on with his rebuilding, lost a considerable amount of trade to his premises.

Another case, where considerable improvement had been made to the surrounding property by the building owners, a claim was made by the owner of a small property, which a year or two before the improvements would have sold for about 1,000*l.* freehold. The claim of the plaintiff in this case was no doubt right to the extent that his building would be affected as to light, and had he in the first instance put forward his claim he would have enabled the building owners to arrange the buildings in conformity with any line which had been settled. But the course taken in this case was to allow the building owners to commit themselves thoroughly to the building operation, and to wait until the full height at which any claim for light must be made was attained. Then the claim was made, and all the work done above the height, even before the injunction was obtained, was eventually decided by the Judge to be pulled down. I suppose the costs and expenses were not less than 2,500*l.* and the time occupied by the action eighteen months; but in this case the buildings were pulled down rather than buy the claimant's premises at an exorbitant price, which I am of opinion was the real object in view. That the building owners were allowed to proceed in front of the windows of the plaintiff with their work until the last moment, and to do so in such a manner as showed conclusively the intention was to erect a high building, without a complaint which, if made, would have stayed the building owners, seems to leave but one obvious conclusion to be drawn. When building owners are thoroughly committed to a building such as this was, it is, of course, highly probable they will pay, and pay high, rather than be stayed in their work; but in this case, if such was the object, it failed; but, as I have stated, with a waste of 2,500*l.* and eighteen months of time.

Another case of a similar class I remember, in which the owner of an adjoining property claimed a right of light and air from a window cut right through the party-wall, but which had been covered up evidently since it had been cut through by the other owner by placing an obstruction in front of it. After the obstruction's removal during the pulling down, the case set up was that light came regularly through this window, and it was of great and serious consequence, and that the obstruction was not there to impede it. Also a general claim was made that the height of the buildings was such as to interfere with the light of other windows. An interim injunction was refused, and the building owner allowed to proceed on the usual terms until the trial of the action. The decision eventually given by the judge was that there was no claim for this particular window, but that there was damage to light to some other windows, by the height of the buildings, though they were only affected laterally; the damage to these lights was only proved to a trivial extent (covered easily by small monetary damages) but an order was made for pulling down; thus illustrating the risks and uncertainties of the present methods of trial. As a consequence, the object for which the claim was started succeeded, and the building owner, rather than pull down, paid 1,500*l.*, and with his own costs expended considerably over 2,000*l.*; the whole value of the adjoining property from whence the claim was made was about 3,000*l.* These cases are not singular; there are undoubtedly hundreds of them, and the waste and delay and uncertainty would total up to an enormous sum of money every year.

Passing from the reasons which influence the bringing of a large portion of these actions, and the uncertainty as to their results, more particularly to the question of delay to building operations, I would impress the serious nature of this point by drawing attention to the course of an action similar to many I have had to deal with.

There being no means such as I have suggested (there should be under a technical court) by which notice can be given to all adjoining owners, it is usual for these claims to be made only when building operations are observed to be preceding, at all events where it has not been brought to the knowledge of the adjoining owners by a party-wall notice or some other means required under the Acts dealing with building operations. When notice is received from the claimant it is possible it is followed up by some little time being spent in negotiations, then, if these fail, by an application for an injunction, all this probably occurring after the building owner is committed to his contract. Necessarily, in claims such as these, complicated by many drawings and technical questions, the judges cannot give a decision on the application for an interim injunction and the case goes for trial, sometimes with and sometimes without the grant of the interim injunction; and from the date at which notice was first given for an injunction the trial will probably not be less than twelve months, and may not infrequently extend to eighteen months or two years. Building owners and professional men will understand what such a delay means in the midst of a building operation, the difficulty with the contract and contractor, and the loss of rentals and of business, and will be able to estimate pretty accurately what pressure such delay brings to bear on the building owner to come to a settlement even upon terms which may be absolutely outrageous.

Another and strong incentive to acquiescence in heavy claims, to avoid actions at law, is, that in order to try these cases it is necessary to bring a considerable amount of evidence before the judge and jury, all of which is expensive, and all of which must be met on the other side by experts and witnesses equally expensive, and both may fall on one of the litigants.

I have known cases in which, for the proof of one angle of light (which was only considered a minor portion of the case), something like eight or ten drawings had to be prepared with all the necessary copies, and what is even still more expensive, models of the building in question prepared also. In cases, the decisions of which are so uncertain as these decisions are, it is absolutely necessary to put in evidence of the most minute character, so that it shall be most thoroughly brought home to the jury as well as the judge (the jury, too, composed of men who have no technical knowledge) the exact value of each claim made. Now, on the other hand, this evidence, of course, would be entirely unnecessary in the event of the case coming before the Technical Court, where the true nature of the claims would be easily and speedily ascertained and dealt with.

I think what I have said goes a long way to prove what the expense, difficulty, delays and uncertainties are in dealing with cases of light and air, and I think also sufficiently prove the necessity there is for some radical alteration in the law, while the advantage to be gained by determining these cases expeditiously and economically, are, I think, evident to all. It is not a question of taking away any rights of property, but of protecting those who have rights from having them taken away, and those who desire to build from paying blackmail.

The suggestion which is made for a remedy, is the constitution of a Technical Court, under the London County Council, in London, and under the corporation in provincial towns and cities. Every building owner should be compelled to deposit a full set of the plans for any new building or material alteration of an existing building with this authority, paying such fee as will cover the expenses of the Court in dealing with them, or as may be deemed necessary by such Authority. The Court should then require the owner to give notice to all the adjoining owners, or others who may be affected, and after examining the proposed plans, to ascertain what, if any, interference with rights of light and air or other easements existed, determining also at the same time that the plans complied with their by-laws. Then the Court should proceed to hear, if required, the objectors and the building owner, and after such hearing, decide as to what modifications, if any, of the plans were necessary before consenting to the building being erected. The fact that such a decision was given before building operations were commenced, and before the building owner was pledged to his contract with his builder, would of itself be a substantial boon, apart from the greater saving obtained of time and money, from its being an absolute preventive of blackmailing in petty or trumped-up cases, while such decision would effectually protect, on the other hand, those who had legitimate rights from the chances of buildings being run up without notice, and their rights improperly interfered with. I fail to see that any proper vested interest could suffer injury, and under these circumstances the good arising from it, as I think I have shown, must undoubtedly prove a valuable help to public and professional alike, and serve thus to encourage building operations. . . . I suggest what seems to me a simple means; that is, an extension of the powers of the Building Act Tribunal in London, and of the Local Authority for the provinces. The fees charged to establish the necessary tribunal or court to be made to cover all the expenses of such court and its attendant officers, and I suggest they would still be moderate enough to become a mere drop in the ocean compared with the present wasteful process. Future discussion on this subject may devise better means; but anyway, it is in my opinion (and I trust it will be the opinion of all those to whom I speak), evident that the settlement of this subject is urgent, and should not be longer delayed . . ."

BOOKS RECEIVED.

A MANUAL OF CHURCH DECORATION AND SYMBOLISM.—By the Rev. Ernest Geldart. (A. R. Mowbray & Co.)

LOCKWOODS' BUILDER'S AND CONTRACTOR'S PRICE-BOOK; 1900. (Crosby Lockwood & Son.)

CAERWENT EXPLORATION FUND.

WE have received from the Executive Committee a Report of the work that was carried on at Caerwent last summer, from which we extract the following particulars :—

The excavations which have been conducted under the direction of a Committee, consisting of Messrs. Hudd, Martin, Pritchard, and Ward, began on August 17 on a plot of three acres of meadow land in the south-west corner of the city. On the west side of this plot the city wall is continuous, and, except possibly in one spot, both inner and outer faces are still clearly visible, though, of course, the wall has lost something of its original height. On the south of this plot the wall is much more decayed, and in several places has been destroyed, with the exception of the inner face. This has, however, been traced by trenches, and has no doubt been preserved by the earth which has accumulated against it. The rounded angle between the west and south walls, when cleared of briars and bushes, was found to be comparatively well preserved, and in one place the wall cannot, on the inner side, be far short of its original height. The excavations here were extremely interesting. In one place holes were sunk down to the foundations on both sides, so as to obtain a complete section of the lower part of the wall. The lower courses were found to rest on a layer of uncemented, irregular blocks of stone or boulders, at a depth of about 11 ft. 6 in. below the present interior ground level. The width of the wall at this place was about 11 ft. at the base, diminishing by offsets to about 9 ft. 6 in. at the ground level.

This excavation also revealed on the inner side of the wall a notable change in the nature of the masonry. The older work of good and regular courses was succeeded towards the east by very inferior and irregular masonry. The fracture or line of junction between the two may possibly, but by no means certainly, indicate repairs. To the east of this excavation, and at about the middle of the rounded angle, a platform, presumably for ballistæ or other engines of war, was uncovered. This platform, which may have served also to strengthen the curved portion of the wall, was certainly carried up some feet above the interior ground level.

The ground inside the walls was examined by trenches dug at an angle of about 45 deg. with the city walls. For a distance of about 100 ft. from the west wall no foundations, with one small exception, were discovered ; but the trenches revealed, at a depth of about 3 ft., a layer of black earth, which was fairly well distributed over the extreme south-west corner of the city. This layer contained much pottery of the commoner kind, coins, and bones of animals, and it has further interest as affording an indication of the contour of the ground in Roman times.

Further to the east foundations were speedily found, and when followed up revealed the existence of at least three separate buildings. No. 1 (beginning on the west) consists of two rooms, the larger of which contains one furnace of a not very usual type, and another construction in the centre of the area, which may have been a furnace, but, if so, it is somewhat peculiar in design. This building, which is built across walls of an earlier construction, would seem to have been a factory rather than a dwelling-house. Immediately north-east of, but not certainly belonging to, this building is a rectangular paved space of about 13 ft. by 6 ft., enclosed by four walls, of which the southern one is pierced by a well-turned arch. This space was almost entirely filled with fine earth, and contained slag, fragments of metal resembling the collars of a pipe, and quantities of pottery, including an unbroken specimen of a jar of black ware. Although there were many traces of the action of fire, it is by no means certain that this construction served as a furnace, and the arch in the south wall is an obvious objection to its having been a tank. It is possible that it may have had some connexion with the trade or manufacture carried on in the adjoining building, but at present its use must remain undecided.

From this point a wall led eastwards for some 67 ft. to a large house of a most interesting type. This house consisted of a centre area or court surrounded by rooms on all four sides. A corridor also runs along the outer side of the eastern rooms. The rooms on the north-east and south sides are mostly small ; on the east there are two large rooms, one of which contains a projecting course of masonry abutting against its north wall, which may have been the foundation of a dresser or of a bench. On the south side there is a hypocaust with brick pilæ, but the pavement has disappeared. The floors of most of the rooms were either of mortar, *opus signinum* work, or rammed pebbles. The central area has not yet been fully explored, but it is of peculiar interest, as it shows an ambulatory paved with coarse red tesseræ separated, at any rate on the western side, from the internal area by courses of solid masonry, which supported columns. Of these, two have been found so far, and one capital with good early mouldings of the Roman Doric order. A finely-constructed stone drain led from this western side of the court under the rooms on the south side of the house.

Projecting from the southern side of the house is a platform, 14 ft. by 12 ft., of solid masonry, with channels cut in its surface leading into a drain on its western side. The drain, which has a steep fall to the south, is paved with large tiles. This platform appears with very little doubt to have been a latrine, but its size is unusual.

North of the house No. 1, the foundations of another fine house with a hypocaust, and a room with an apsidal end, have been found ; but as this house runs into ground which will not be taken up for excavation till next summer, no further details can be given at present. . . .

All the excavations have been fruitful in finds of the usual character, but though many of them are interesting, no object of exceptional value has been found. The numerous coins are mostly late, and but few are well preserved.

TRANSVAAL WAR : HOMES FOR DISCHARGED SOLDIERS.

THE following announcement is made by the Executive of the proposed Building Trades Gift to the nation, which is to take the form of some permanent homes of rest for discharged soldiers :—

Though most laudable efforts are being made on all sides to meet the requirements of wounded soldiers returning from the Transvaal War, so that men leaving hospital may have an opportunity to regain strength before resuming their mititary duties, the discharged and perhaps permanently invalided soldier appears to have been forgotten, and hence the arrangements for helping him require immediate attention, the more so as the preparations to meet his case suitably and permanently necessitate considerable organisation in advance.

At the suggestion of Mr. Edwin O. Sachs, the architect, in consultation with several leading builders and manufacturers, it has been decided to ask the building trades of Great Britain to help in this matter. With the aid of the building trades an effort is to be made to keep the discharged soldier out of the last resort for the helpless—the workhouse—where he is only too liable to drift even when provided with the meagre pension granted to those who are maimed for life in the service of their country. Lord Pirbright has generously given an extensive freehold site for the erection of suitable Homes of Rest at Bisley, where soldiers who have been through the campaign may have an opportunity for regaining strength, or where the permanently maimed or invalided may be assured a comfortable abode in which to end their days.

The Soldiers' and Sailors' Help Society has undertaken the management and maintenance of the homes to be erected on this site, under a scheme initiated by Princess Christian, who has formed a special Homes Sub-Committee to attend to this matter. This Sub-Committee, it should be added, comprises, besides Princess Christian, Princess Henry of Battenberg, the Duchess of Connaught, Lord Pirbright, Lieut.-General Geary, Lieut.-Col. Gubbings, Major Martin, and Major G. E. Mallet ; while the Duke of Connaught, Earl Derby, and Lord Pirbright have consented to act as trustees to the Homes.

The extent of the assistance to be rendered by the building trades will be the erection and equipment of six cottage homes, comprising in all one hundred beds, together with the necessary offices, and a large recreation-room and workshop. These six homes will constitute the building trades' gift to the nation. The gift is primarily to take the form of contributions *in kind*, and offers of building materials, finished joinery, fittings, appliances, and the like will be gladly welcomed. It is, however, hoped that where firms cannot see their way to contribute in kind, they will not hesitate to assist with cheques to meet the cost of such labour as cannot be gratuitously obtained.

Regarding the collection of materials and work, and the supervision of the buildings in course of construction, the gift will, of course, not be hampered by any unnecessary administration expenses, seeing that not only has the technical direction and advice been offered by several architects and surveyors, but presents have even been made of such minor matters as stationery, drawing materials, printing, lithography, &c., required for the office.

The administrative work, together with the construction of the homes, will be in the hands of a small executive comprising the originator of the scheme, Mr. Edwin O. Sachs (acting as chairman), Mr. Fred. R. Farrow, Mr. F. Hammond, and Mr. Ellis Marsland (District Surveyor), with Sir John Taylor, Mr. Thomas Blashill, and Mr. Arthur Cates as advisers.

The correspondence in connexion with the gift will be dealt with by the executive at the offices of the British Fire Prevention Committee, who have lent their reading-room for this purpose, and all offers of contributions, &c., should be addressed to *The Executive of the Building Trades Gift, No. 1, Waterloo-place, Pall Mall*, whilst all cheques should be crossed "Lloyd's Bank" (Building Trades Gift No. 1 account).

All contributions will be acknowledged by the Executive, and all receipts for cheques will be signed by two members, whilst the accounts will be duly audited by representatives of the donors. The Editor of the *Builder* has offered his columns for the public acknowledgment of the gifts, which will also be announced in the usual way both in the daily and in the technical press.

The donors will be represented by a limited number of "stewards" acting for the builders, the material makers, and the specialist firms respectively. Mr. J. Howard Colls, Mr. George Jennings, and Mr. J. Randall (President of the Builders' Institute) are the first who have accepted stewardships.

There is, perhaps, one final feature regarding the gift which may particularly appeal to the building trades, namely, that the discharged soldier who can show that he has for some years been working in the building or allied trades prior to service with the colours, or having been connected with these trades whilst a Reservist, will have precedence when a selection has to be made for a place in the Homes in question, so that the Homes will always be identified with the interests of the donors.

SANITARY INSPECTORS' ASSOCIATION.

THE New Year's address of the new President of this Association (Sir Hugh Gilzean Reid) was given on Saturday last at Carpenters' Hall, Mr. W. H. Grigg, the Chairman, introducing Sir Hugh.

Sir H. Gilzean Reid referred to the eminence as experts in sanitary science of his predecessors, Sir Edwin Chadwick and Sir B. W. Richardson, and the practical experience in municipal work of Sir John Hutton. He had devoted much time and thought to the question of the bettering of the sanitary condition of the people's dwellings. He had published a little book on the subject, which had reached a circulation of 300,000, and that was perhaps the only title he had to the honourable position he had been invited to occupy. The present King of the Belgians, some forty years ago, when Duke of Brabant, had said, "Everywhere the beautifying of towns was accompanied by an increase of general welfare." He added, "The working classes have a right to be cared for, and we ought to do our utmost to improve their dwellings and to give them fresh air and room in which to breathe." That was the keynote of the work in which he had been himself engaged. In visits he had made in 1860 to dwellings in Edinburgh, many of which were occupied by skilled workmen, he had found a state of things—similar conditions were too often found in London to-day—in which the occupants dragged out a miserable existence in homes where ordinary comforts were utterly unobtainable. The houses of the people were small, badly erected, badly ventilated, and devoid of domestic decencies.—The new president then referred to the successful operations of the Edinburgh Co-operative Building Society,

formed in 1861, with an extremely small capital. In a very short time it rose to 10,000*l.*, and building land was obtained upon which excellent self-contained houses were gradually erected, the most modern appliances for ventilation and drainage were introduced, with little gardens in front and playgrounds behind. The company yielded a good 8 per cent. return, and the houses were sold to the members at much less than they could have been bought for in the open market. These houses were acquired by the working classes by weekly payments not much exceeding the rent of the old houses. The value of these dwellings not long ago was estimated to exceed no less a sum than 500,000*l.* The testimony of sanitary inspectors and medical officers of health through these years was that the general state of health had been greatly improved, and the average death rate reduced, in addition to all the comforts and benefits which the possession of these houses had brought to their owners. Other cities both in Scotland and England had followed this example, but much more should have been and could have been done. Parliament, by making the transfer of real estate cheap and easy, and by facilitating the acquirement of suitable sites, could do something to help. Municipal bodies could do and were beginning to do much under powers given them, too restricted though they were, and which needed amending and extending to be really useful. Much had been done in many ways for the more healthful housing of the people. All honour to the Peabodies and Rowtons, who in their own way were helping to wipe out the blackest stain of modern civilisation. But such generous and wise efforts as these, especially in London, were, and must be, of rare occurrence. They could, after all, only affect a small proportion of the wage-earning multitude. Whilst approving of all that the Government and the municipal bodies were doing, he should ever breath the gospel that it is essential for the people to do more for themselves. What was wanted was a simple agency easily understood, within the reach of all, and of universal application, and that we had in the principle of co-operation. It had been put to the test, and had met with wonderful success in many parts of France and Germany.

Instances were given in the address of sanitary progress in the mining villages of Durham, in which up to nine or ten years ago the most deplorable conditions prevailed. Some of the local newspapers in which he was interested took up the subject and exposed the neglect of the authorities. The result of the revelations was the prosecution of those papers in actions for libel, which had cost them 2,000*l.* But the after effect was worth the martyrdom, for the County Council of Durham took the matter resolutely in hand, and all their castigation was forgotten. A general diminution of the death rate followed. In the period 1890-93 the death rate averaged 19·9 per 1,000, while in the succeeding period, 1894-98, it averaged only 17·8—a reduction of 2·1 per 1,000.

A vote of thanks was accorded on the motion of the Chairman, seconded by Mr. West (Walthamstow), and supported by Messrs. Woonton, Young, and other members.

Correspondence.

To the Editor of THE BUILDER.

ANOTHER STRANGE COMPETITION.

SIR,—We beg to bring before the notice of your readers another abortive and unjust competition, showing that the public evidently have an idea that architects are always ready to devote their time and energies and give away ideas for their benefit, to use as they think proper.

About October and November last advertisements appeared in the local and architectural papers requesting architects to submit designs to the Billericay Rural District Council for additions to their infectious hospital, and stating that the selected architect would be entrusted with the carrying out of the work at the usual commission. We understand about six architects took the trouble to measure up the old buildings and submit designs for the additions. No acknowledgment was made of the drawings, and no information could be obtained as to the result of the competition until it was noticed in the local papers that the Rural District Council had instructed a local architect to prepare plans in accordance with the ideas of the house doctor, which ideas were probably framed and fashioned by a close study of the designs submitted.

May we suggest that the architects who competed send you their names and addresses, and if you would kindly forward them to us we would communicate with them and send in a combined protest against such proceedings. "COMPETITORS."

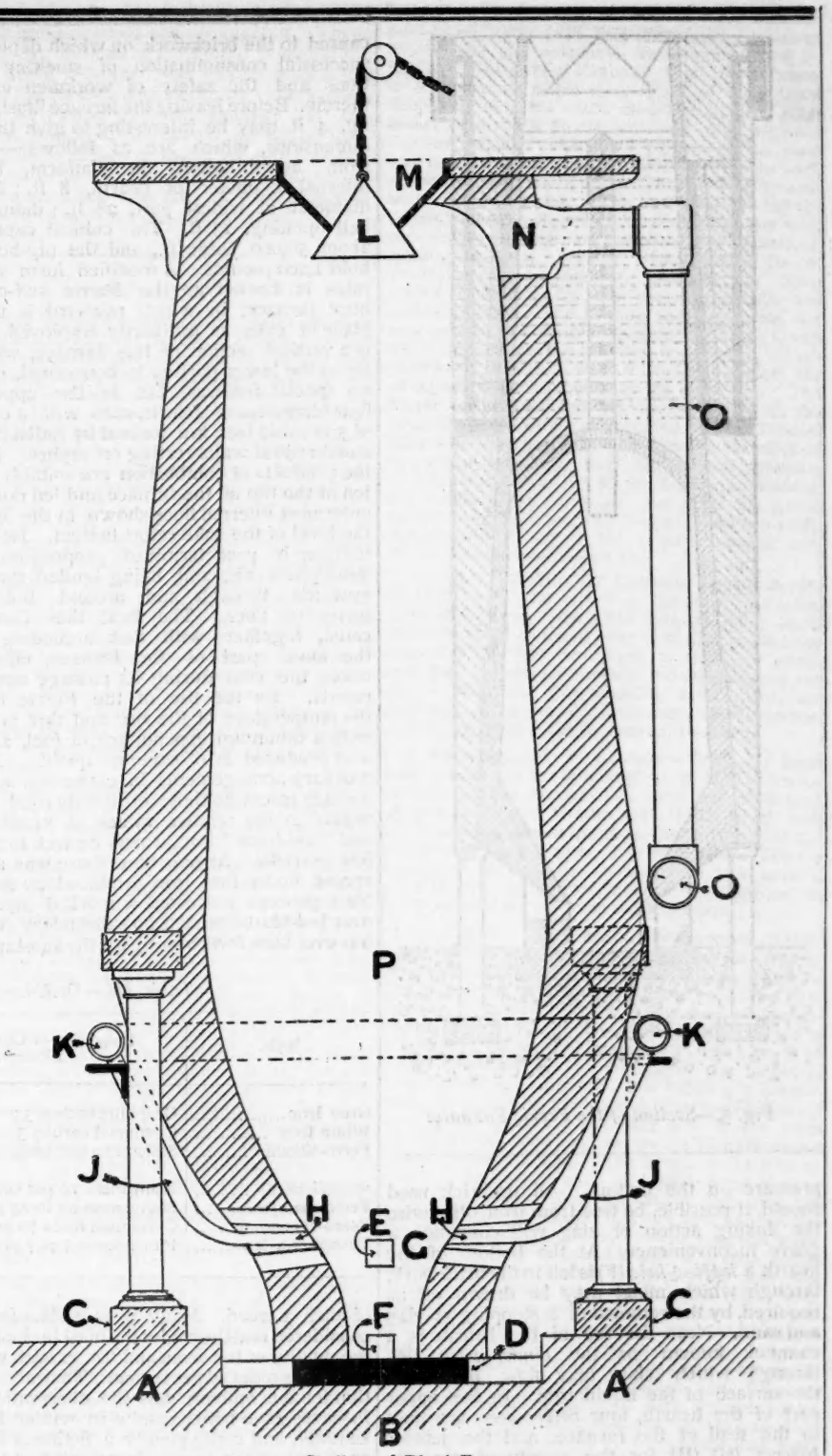

Fig. 4.—Section of Blast Furnace.

The Student's Column.

DETAILS OF STRUCTURAL IRON AND STEEL.

2.—IRON EXTRACTION (*Continued*).

BLAST furnaces for the making of pig iron differ very much with regard to details of construction; but so far as British practice is concerned, it seems to be generally agreed that the most suitable height is from 60 ft. to 80 ft., and that the configuration of the inner surface should exhibit easy flowing curves from top to bottom. Furnaces have been built as high as 103 ft., but it does not appear that any advantage is gained by the adoption of a greater height than 80 ft., which is that generally used in the Cleveland district. In Lancashire and Cumberland, blast furnaces are usually from 60 ft. to 70 ft. high; in the United States, they vary from 40 ft. to 70 ft. high, according to the description of ore to be operated upon; and the latter dimensions also apply to most of the furnaces on the Continent. Without considering in detail the mechanical and other auxiliaries of a blast furnace, we may with advantage examine its essential points. Taking first the furnace shown in section by fig. 4, and which may be regarded as fairly typical of the ordinary blast furnace, we find the foundation up to the ground line to be of brickwork (B) resting on clay. A circular base of firebrick (A) (A) is formed round the *hearth-bottom* (D), and on this casing is a stone curb (C) supporting the cast-iron columns which bear the greater part of the structure. The columns are twelve in number, about 18 ft. high by 2 ft. 4 in. diameter, and of 2 in. metal. Firebrick is the material used in the construction of the furnace shell, which is cased externally with wrought-iron plates varying from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. thick, and internally with fire-lumps 5 in. thick. These are carefully dressed both on beds and joints for a short distance above the *hearth* or *crucible* (G), which occupies the neck of the funnel-shaped portion of the furnace (P) known as the "boshes." The *hearth-bottom* is made of firebrick or other infusible material, laid in such a manner as to counteract the tendency of the molten metal and slag to undermine, and to exert upward

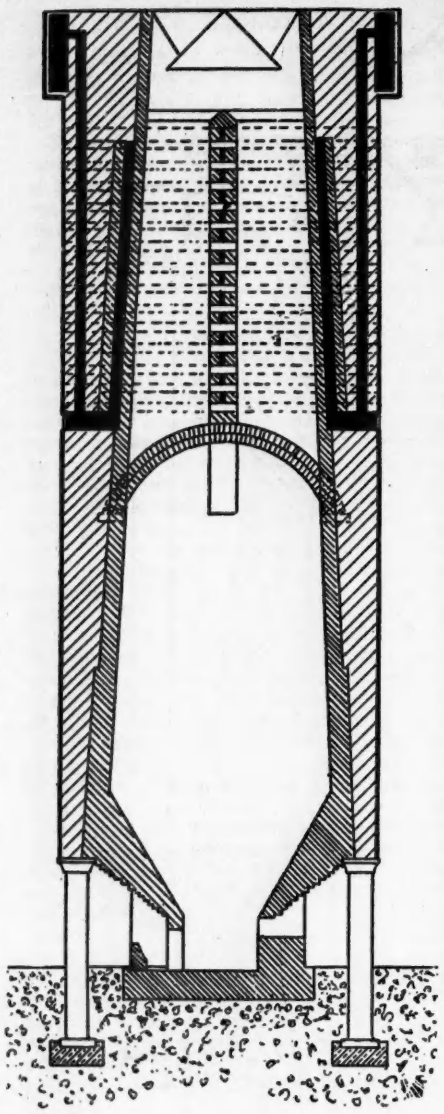

Fig. 5.—Section of the Ferrie Furnace.

pressure on the bottom. All firebrick used should, if possible, be free from iron, otherwise the fluxing action of slag will constitute a grave inconvenience. At the bottom of the hearth a *tapping-hole* (F) is left in the brickwork, through which metal may be drawn off as required, by the removal of a stopping of clay and sand. Near the top of the hearth is a channel, known as the *cinder-notch* (E), through which slag may flow out from the surface of the liquid iron. In the upper part of the hearth, four *tuyère-holes* are built in the wall of the furnace, and the jets or *tuyères* (H) (H) for the supply of air pass into the holes, their nozzles being generally protected from the heat by a water-jacket continuously fed with cold water. Each *tuyère* is joined by a branch connexion or "goose-neck" (J), with the blast pipe (K), which is carried partly or entirely round the furnace, and which receives its supply of air, either cold or hot as the case may be, from a blowing engine. The top, or *throat*, of the furnace is closed by a bell (L) and hopper (M) of cast iron, by means of which materials are introduced from time to time, without interfering with the egress of gases from the opening (N) at the side of the furnace. Into this opening is fitted the end of a rivetted iron pipe (O) which serves to convey the heated gases to boiler fires, to superheaters, or to calcining furnaces. Thus the products of combustion are utilised for steam raising, for the provision of a hot-air supply to the blast furnace, or for roasting ore, as may be preferred. The top of the furnace is finished with a platform or gallery, supported by brackets; and the main blast-pipe is upheld by braces attached to the cast-iron columns. In constructing a blast furnace, the upper portion is built on the columns before the hearth and its enveloping brickwork are added. This mode of procedure permits any settlement of the main structure to take place before the hearth work is built. It may, therefore, be seen that the bulk of the weight is borne, as before stated, by the cast-iron columns, and that no unnecessary strain is caused to the brickwork on which depends the successful consummation of smelting operations and the safety of workmen engaged therein. Before leaving the furnace illustrated in fig. 4 it may be interesting to give the chief dimensions, which are as follows:—Height from hearth-bottom to platform, 80 ft.; internal diameter of hearth, 8 ft.; internal diameter at widest part, 28 ft.; diameter of bell opening, 13 ft. The cubical capacity is about 30,000 cubic ft., and the pig-beds will hold 1,200 moulds. A modified form of apparatus is known as the Ferrie self-cooking blast furnace, in which raw coal is used in place of coke as ordinarily employed. Fig. 5 is a vertical section of this furnace, which, so far as the lower portion is concerned, exhibits no special features, but in the upper part four chambers or retorts, each with a capacity of 500 cubic feet, are formed by radial and circumferential walls resting on arches. Part of the products of combustion are suitably collected at the top of the furnace and led down the outermost internal flues shown in the figure to the level of the coke retort bottom. Here they mingle, in predetermined proportions, with atmospheric air, and, being ignited, they pass upwards through and around the inner series of flues. The heat thus communicated, together with that ascending from the lower part of the furnace, effectually cokes the coal during its passage down the retorts. By the use of the Ferrie furnace the temperature of the ore and flux is raised with a minimum expenditure of fuel, and the iron produced is of superior quality. All the auxiliary arrangements in connexion with the furnace resemble those ordinarily used. With regard to the relative values of "cold-blast" and "hot-blast" iron, it may be well to make a few remarks. At one time there was a widespread belief that iron produced by the cold-blast process possessed a marked superiority over hot-blast iron, but no satisfactory evidence has ever been forthcoming for the substantiation of such a creed. Many iron-masters formerly considered that the colder the blast the better was the quality of the iron, and the greater was the quantity produced per furnace. The only foundation for this opinion was the observation that furnaces gave better results in winter than in summer, and consequently a fictitious importance was given to the lower air temperature prevalent in the former season. As a matter of fact, subsequent investigation demonstrated satisfactorily that hygrometric, and not thermometric, differences were the governing factors. The economic advantages of the hot-blast process are now thoroughly appreciated by English and Scotch manufacturers, and in a less degree by Welsh smelters, because ores produced in Wales are so readily reducible that the saving possible by the aid of the newer method is comparatively small. As regards the question of efficiency, Sir William Fairbairn stated some years ago that the quality of iron had been greatly improved since the introduction of the hot blast. This he attributed to the higher temperature attained, which in his opinion tended to volatilise phosphorus, sulphur, and other injurious ingredients which at a lower temperature would combine with the iron. In the course of his investigations, Sir William discovered very little difference between hot and cold blast iron. It is, of course, quite possible that cold-blast iron of a particular make may be better than samples made elsewhere, but the difference will be due to natural superiority of the ore, and not to the method of smelting.

The chemical changes taking place in a blast furnace have previously been briefly described, and it will now only be necessary for us to consider the nature of the main and by products resulting from the operation of smelting. Blast-furnace slag collecting above the iron is run off through the cinder-notch into wagons, and is practically a waste product, though comparatively small quantities are utilised for paving, for cement manufacture, and for the production of slag-wool. This substance, which is largely used for lagging steam boilers and pipes, is similar in appearance and constitution to glass-wool, and is prepared by subjecting a stream of molten slag to the action of a jet of air under pressure. Crude iron drawn from the furnace is of variable quality. In the pig-moulds a part of the carbon taken up by the metal separates and rises to the surface in the form of graphite, known to furnacemen as "kish." Grey or graphitic iron is that from which the bulk of the carbon has separated during cooling from the state of solution in which it was held when hot. Mottled iron results when partial separation has taken place; and white or carburetted iron is produced when iron and carbon are in a state of chemical combination. Grey iron is produced by furnaces where silicious ores are treated with a maximum of fuel at a high temperature, whilst white iron results from ores, containing little silicon, and smelted with a minimum of fuel. By intentional variations in working the furnace, the character of iron yielded may be considerably modified. By the smelting of silicious ores pig-iron may be made containing a large proportion of silicon; by the reduction of manganiferous ores pig-iron can be produced containing a high percentage of carbon, and from ten to eighty-five per cent. of manganese; chrome iron ore yields a compound containing from sixty to seventy per cent. of chromium; and phosphoric pig-iron, with from five to seven per cent. of phosphorus, is made by the smelting of ores rich in phosphorus, or by adding slag containing basic compounds to an ordinary charge. The above variations of pig-iron are required for special foundry and other purposes, and are classified for reference in the following table:—

Table III.—Ordinary and Special Varieties of Pig Iron.

Style.	Proportion of Characterising Element.	Chief Use In Manufacture.
Grey Iron.....	Graphitic carbon 3·30 per cent. ...	Foundry purposes and steel-making.
White Iron	Combined carbon 3·20 per cent. ...	Malleable or wrought iron production.
Ferro-silicon	Sillicon 10 per cent.	Conversion of white into grey iron and preventing combination of carbon in cast iron
Spiegel-eisen	Manganese 10 per cent.	Special castings and steel making.
Ferro-manganese ...	Manganese up to 85 per cent. ...	" " " " "
Ferro-chromium.....	Chromium 60 to 70 per cent. ...	Steel making.
Phosphoric Iron.....	Phosphorus 5 or 7 per cent. ...	" "

So far we have traced the methods adopted for the extraction of iron from the ore, and the resultant pig-iron is found to be a mixture or an alloy of varying composition, from which other compounds, known as cast-iron, malleable or wrought-iron, and steel are subsequently made.

The processes by which these materials are evolved from pig-iron will now be discussed, and those by the aid of which iron and steel are directly produced from the ore will be briefly described.

MANUFACTURE OF CAST IRON.

It is frequently said that the manufacture of cast-iron is completed when the metal leaves the smelting works in the form of pig-iron. In one sense this statement is perfectly correct, for the primary object of subsequent operations carried on in the foundry is to melt and mould the metal into such shapes as may render it suitable for practical application. Nevertheless, it is the fact that chemical changes actually take place in the metal as the direct result of foundry work. We, therefore, propose to dwell briefly upon the operations coming within the province of foundry practice. Then we shall see in what respects manufactured cast-iron differs from the raw material as delivered by the smelter, and a convenient opportunity will be afforded for the consideration of matters with which the student ought to be familiar, because they have an important bearing upon constructive work.

Foundry practice includes metal mixing, furnace work, pattern-making, moulding, casting, and other minor matters. Unless under exceptional circumstances, ironfounders never make castings from simply one kind of iron not merely because judicious blending tends to facilitate their work, but for the additional and more important reason that a mixture of

several brands of iron is invariably stronger than the average collective strength, each taken separately. The exact proportions of a mixture vary according to the form of the castings required, to the work for which they are intended, and to the stresses they may have to withstand. The art of the founder is one involving an intimate knowledge of cast iron in its different varieties, and of the ascertained results yielded by their admixture. It is very unlikely that any architect will be found to possess the qualifications necessary to enable him to prescribe what should be the exact constitution of the metal in the castings which he may require, and he will, therefore, do well to limit his demands to the expression of tests and of general conditions which are to be observed. At the same time it is desirable that the principles of foundry work should be duly appreciated. We have previously seen that pig-iron is roughly classified by the descriptive terms grey, mottled, and white, but, as a matter of fact, there is no boundary line separating the three varieties. It is true that between typical grey and white irons an important difference exists, for the former contains carbon in a state of mechanical mixture, and the latter exhibits the same substance chemically combined. Grey iron, however, may be said to merge gradually into white iron, and the metal at the intermediate stage is that known as mottled iron. Thus we see that the distinctions in question are purely empirical, and of no real value to the ironfounder. Consequently, eight grades have been established for commercial purposes, each being recognised by a numeral. Numbers 1 to 4 are applied to grey iron, No. 5 to mottled iron, and Nos. 6 to 8 to white iron. Pig-iron is further designated by, and its value estimated according to, the district from which the ore is derived, and, as before mentioned, there are special varieties of pig-iron, each named in accordance with its characterising element. No. 1 iron is readily fused, and being very fluid in this state it is suitable for fine ornamental castings, but is deficient in hardness and strength; No. 2, being stronger and harder than No. 1, is well adapted for heavier ornamental castings; No. 3 is tough and strong, producing castings capable of resisting heavy weights and sudden strains; No. 4, known as "foundry pig," is very hard and tenacious, it is most useful for making heavy castings which require little workshop preparation before use. The higher numbers are used almost entirely for the manufacture of malleable iron and steel. Combinations of Nos. 1, 3, and 4 are considered to be very suitable for structural purposes, giving castings which are both clean and strong. So far as geographical distinctions are concerned, Scotch iron is generally and deservedly popular for the production of castings for architectural work; Cleveland and Lincolnshire iron are suitable for large castings, but they are much used for mixing purposes, as also is Cumberland hematite. Welsh iron is of exceedingly good quality, and is frequently employed to increase the strength of other brands. Wrought iron and steel scrap are added with advantage to iron mixtures in proportions depending upon the intended application of the castings.

Having settled the ingredients to be used, the next process for the founder is to melt the metal. For this operation a furnace is used somewhat resembling a blast furnace, and known as a cupola. This is built in cylindrical form, having an external shell of cast or wrought iron, lined with fireclay or firebrick. As the cupola is not worked continuously, after the manner of a blast furnace, the lining need not be particularly thick. In the case of a furnace working from three to four hours daily, a thickness of 9 in. is ample; if the time of work extends throughout the day, the thickness may be increased up to 12 in. Air is introduced into the furnace by means of *tuyères*, and the blast is well distributed, for the double purpose of reducing pressure and of securing a large surface contact between the air and the fuel. To the iron and fuel used in the cupola, limestone is usually added with the object of separating from both any earthy matters which are present. These combine with the limestone to form slag, which floats on the surface of the fused metal. Ferro-silicon is sometimes introduced with ordinary pig-iron into the furnace, in order to keep the iron grey by preventing the chemical combination of iron and carbon. Re-melting cast-iron is beneficial, but repetitions of the process more than about ten times cause diminution of tensile and transverse strength, though crushing strength and hardness are augmented. These changes are indicative of altered constitution, carbon being combined, and silicon eliminated. Thus, as the repetition of re-melting takes place, the iron so treated gradually assumes the condition in which it is known as white iron. Bearing these things in mind, we find that furnace practice in the foundry has an important influence upon the character of iron, although some writers say that none is intended.

OBITUARY.

M. PAUL SÉDILLE.—We greatly regret to learn of the death of M. Paul Sédille, a French architect whose name and some of whose works are well known in London; among his many buildings the Magasin de Printemps at Paris was one of the best known, and was an exceedingly successful treatment of street architecture on a large scale, and with the introduction of colour in tile panels, in a manner which has since been imitated a good deal by other French architects. The building was illustrated in our pages under date February 21, 1885. He was architect for the basilica in memory of Jeanne Darc at Domremy. M. Sédille visited England some time ago for the purpose of studying and writing on English architecture, which he estimated very highly, and judged of in a very broad and sympathetic spirit of criticism. During his visit he made, we believe, not a few friends among members of the arehitectural profession in London. M. Sédille was the son of an architect, M. Jules Sédille, also distinguished in the profession. M. Paul Sédille held the official rank of "Architecte du Gouvernement," and was an officer of the Legion of Honour. He was sixty-five years of age at the time of his death.

MR. W. W. WARDELL.—The late Mr. William Wilkinson Wardell, who died at Sydney, New South Wales, on November 19, 1899, began life as an architect in London. He was elected an Associate of the Institute of British Architects in 1843 and a Fellow in 1850. In 1857 he left London for Melbourne, and in 1858 was appointed architect for St. Patrick's Cathedral, Melbourne. The building was described in the *Builder* of November 6, 1897, under the heading "Foreign." He was also architect of St. Mary's R.C. Cathedral, Sydney. In 1869, Mr. Wardell succeeded, on the resignation of General Pasley, to the office of Inspector-General of Public Buildings in the colony of Victoria, and retired in 1878. During that interval he superintended the erection, in Melbourne, of the Government House, General Post Office, Custom House, Mint, Treasury, Public Library, and other public buildings. For the English, Scottish, and Australian Bank he planned and designed their head offices in Melbourne, with several of their branch establishments. Mr. Wardell removed to Sydney on his retirement in 1878.

GENERAL BUILDING NEWS.

ST. MARYLEBONE CHURCH INSTITUTE AND CLUB.—This building stands upon the site of Nos. 59 and 60, Paddington-street, the latter of which was for some years used for parish purposes, but, being found inadequate, the house No. 59 was acquired. A grant of a piece of land has also been made by the Ossington Buildings Company, which has enabled the architect to obtain a side entrance to the soup kitchen and portion of building devoted to charitable purposes, thus keeping the latter separate, and so as to avoid crowding the main entrance, by which access is obtained to the existing mission church at the rear. The basement contains kitchen (with service lift to club dining-room above), soup dining-room, with waiting-room in connexion therewith, with separate entrance from outside, scullery, larders, coal cellars, and usual offices, with caretaker's sitting-room—the whole, excepting the latter and coal cellars, being lined throughout with white glazed bricks. On the ground floor is an entrance hall, on the right of which is the club dining-room, having a separate entrance from Paddington-street; on the left the library and reading-room; the lobby to entrance to mission church of the Good Shepherd, and off the corridor beyond is a committee-room, capable of division by folding-doors, with a club-room, 23 ft. by 18 ft. at the end; also lavatories. The entrance hall, church lobby, lavatories, and principal staircase are lined with glazed bricks. The principal stairs and landings from the basement to the mezzanine floor are fireproof, and constructed entirely of Messrs. Lascelles' patent concrete stone. On the first floor the front of the building is taken up by a central hall with platform, with a retiring-room attached, capable of seating 150 persons, and divisible, by means of a folding swivel partition, into two rooms for use as committee-rooms or otherwise. A games and chess room is obtained over the committee-room below, bath-room, and lavatories, and billiard-room, 23 ft. by 18 ft., with a top-light. A small mezzanine is obtained between the first and second floors for hats and cloaks. On the second floor are four large bed-sitting rooms for use of members of club; and on the third floor, six bedrooms, linen-room, bath-room, and lavatory. The main front to Paddington-street is faced with red sand-faced bricks with buff terra-cotta dressings to windows and entrances, &c., manufactured by Mr. J. C. Edwards of Ruabon. Over the entrance, in a canopied niche, is a figure of the "Good Shepherd" in terra cotta, modelled by Mr. Daymond. The back fronts are faced with wire-cut Burham bricks. The front portion of the main roof is covered with red Staffordshire tiles, the back portion of the roof of rear buildings being covered with Bangor slates. The building is lighted throughout with electric light, which, together with the sanitary work, was executed by Messrs. J. Bolding & Sons. Messrs. Richardson & Co., of Brownlow-street, Holborn, executed the ornamental ironwork, &c., also the electric bells and speaking-tubes. The heating and ventilating has been carried out by Mr. Stainton of King's Cross. All the floors are fire-resisting, constructed principally upon Messrs. Homan & Rodgers' system, the structural ironwork being by the same firm. The whole of the work has been carried out from the designs and under the supervision of Mr. Thomas Harris, architect, with Mr. A. Yeardye as clerk of the works, Mr. Kent being the general foreman. The contractor was Mr. H. H. Sherwin of Waddesdon, whose contract price amounted to 7,199*l.* 6s. 8d., which includes, with the above sub-contracts, the electric wiring of the mission church and offices in connexion therewith.

PRIMITIVE METHODIST CHURCH, SOUTH MOOR, DURHAM.—On the 6th inst. the new Primitive Methodist Church, which has been erected at South Moor at a cost of 1,400*l.*, was opened. The Sunday schools at the rear have been in use some years, and the new church provides accommodation for 450 worshippers. The building is of stone, the architect being Mr. T. E. Davison, of Newcastle, and the contractor Mr. T. Craven, Beamish.

A NEW MOSQUE IN LONDON.—Proposals have been made for the building of a Mohammedan mosque in the Euston-road, after the plans and designs of Hadjie Muhammed Doulie, which will be somewhat similar to those he prepared for the mosque at Cape Town. The cost of the fabric is computed to be about 10,000*l.* It will have a capacity for nearly four hundred worshippers on the floor, and a gallery for women above.

TEMPERANCE ASSURANCE BUILDINGS, ABERDEEN.—Buildings are being erected in Union-street, Aberdeen, for the Scottish Temperance Life and Accident Assurance Company. The new building is erected on the north side of Union-street, slightly above Diamond-street. It has a frontage of between 30 ft. and 40 ft., and a depth of fully 90 ft. back to Diamond-lane. Its height is five stories and basement. The building is Renaissance in style, and the front is constructed entirely of Kemnay granite. On each side of the main entrance is a saloon shop, extending back the entire depth of the building. The front, on the ground floor, is finished at each end with a pilaster of polished Correnie granite, harmonising with the pillars of the doorway. On the first and second floors the windows project as semi-elliptical bays. The second floor is crested with a granite balustrade forming a balcony for the third floor, the windows of which are round-topped with pillar mullions as contrasted with the square tops and pillar mullions of the under floors. At the third floor level also rise a series of Ionic columns carrying a moulded frieze and cornice. Above the cornice rise two gablets, crowned with Venetian shell ornament surmounted with granite finials. As to the internal arrangements, the ground floor will be available as shops. On the first floor there will be three suites of offices—one of which will be occupied by the Scottish Temperance. The second floor will have four suites of offices, and the two upper floors will be available as a dwelling-house of twelve apartments. The architects for the new building are Messrs. Jenkins and Marr. The contractors are:—Mason work, William Farquharson, Fraser-road; carpenter, Watson & Robb; slater, George Davidson, jun.; plumber, David Ogilvie; plasterer and tile work, James Scott, jun.; painter and glazier work, George Donald & Sons; steel work, George Bisset; electric lighting, Pratt & Keith.

UNITARIAN SUNDAY SCHOOLS, BIRKENHEAD.—These buildings have just been opened by Sir John Brunner. The new buildings are erected on land adjoining Bessborough-road, Oxton, sufficient space having been left between the schools and the road for a new church to be erected. The building consists of a central hall with four class-rooms, and is so arranged that the whole may be converted into one room by means of glazed folding doors, accommodation for 500 being provided. A library, kitchens, and other appointments have been provided; and on the first floor there is a ladies' parlour. The building contract was carried out by Mr. Richard Ailen, of Birkenhead, from plans by and under the supervision of Mr. T. W. Cubbon, architect, of Birkenhead and Manchester. The buildings have cost about 2,500*l.*

PRIMITIVE METHODIST BUILDINGS, OLD KENT-ROAD.—The new St. George's Hall and schools, which have just been built in the Old Kent-road by the South-East London Mission, were opened a few days ago. The new hall has cost altogether over

12,000*l.* The late Professor Banister Fletcher and Mr. B. F. Fletcher were the architects of the building, the chapel of which seats over 800 persons, there being in addition five minor halls. The building was illustrated and described in our issue of July 10, 1897.

SMALL-POX HOSPITAL, SHEFFIELD.—At the Town Hall, Sheffield, on the 3rd inst., Mr. Arnold Royle, C.B., of the medical department of the Local Government Board, held an inquiry into the application by the Corporation for powers to borrow 15,808*l.* for the erection of a small-pox hospital at Crimicar-lane. The City Surveyor, Mr. C. F. Wike, said the hospital would have accommodation for twenty-four beds in the ward pavilion, two in the separation wards, and four in the isolation blocks. There would be provision for thirteen nurses and a matron, ten maids, and the doctor. There would be a laundry, discharging block, mortuary. lodge, shed for disinfectants, &c. In order to increase the cubical capacity of the provision for the maids, another story had been added to the administrative block. The Inspector said the approval of the Local Government Board might be expected shortly.

ARTISANS' DWELLINGS, BURTON-ON-TRENT.—Houses are being erected by the Burton-on-Trent Artisans' Dwellings Co., Ltd., on their estate at Horninglow. Of these houses sixty will shortly be ready for occupation; the accommodation consisting of a living room 12 ft. by 12 ft., having a wooden floor and cooking range; a kitchen 11 ft. by 9 ft. 3 in., with tile floor, copper, fireplace, and sink, and a pantry leading therefrom. Two bedrooms are provided, one 15 ft. 6 in. by 12 ft., the other 11 ft. by 9 ft. 3 in., each containing a fireplace. Complete privacy is secured for each tenant by having a separate passage entrance for each pair of houses, the back-yards being subdivided by brick division walls. The out-offices comprise water-closet, coal-house, and ashes-place. A garden 50 ft. to 63 ft. long is provided for each tenant. There are also in course of erection other houses having five rooms of somewhat larger proportions, the fifth room being an extra bedroom. Up to the present, estimates for 133 houses have been accepted, the contractor being Mr. Henry Edwards. The architect for the work is Mr. Thomas Jenkins.

EXTENSION OF WIRRAL INFECTIOUS HOSPITAL.—At the Wirral District Council offices, Birkenhead, Colonel Slack and Dr. Wheaton conducted a Local Government Board inquiry, on the 4th inst., into the application of the Wirral Joint Hospital Committee for compulsory power to enable the Committee to purchase two acres of land in order to extend the infectious hospital at Spital. The Clerk to the Committee (Mr. J. E. S. Ollive) stated that the present hospital consisted of two blocks, and an iron erection for convalescents, there being in all twenty-four beds and four cots, together with administration buildings. Evidence in support of the application was given by Mr. C. O. Francis (architect) and others.

COTTAGE HOSPITAL, URMSTON, LANCASHIRE.—Urmston Cottage Hospital was opened on the 6th inst. The hospital has been erected in commemoration of Her Majesty's Diamond Jubilee, and has cost upwards of 1,200*l.* The designs for the building were prepared by Mr. Edward Hewitt, architect, of Manchester. Mr. J. Spark, of Urmston, was the contractor. Accommodation is provided for nine patients, though that number can be slightly exceeded in case of necessity. The entrance forms a central feature in the front elevation. To the right is the matron's sitting-room. On the opposite side is the day-room. At either end of the corridor at the back of the hall, on the ground floor, are the two wards, the sizes of which are 22 ft. by 14 ft. by 13 ft. high. There is provision in each for three beds and a cot. Leading from each ward is the sanitary block. Between each ward and its sanitary block is a cross-ventilated passage. On the ground floor also is a small ward, which can be used for isolating a patient if necessary. Next to this ward is the operating-room, and beyond that the bath-room. Matron's, nurses', and servants' bedrooms are placed on the first floor, where are also situated the kitchen, linen-room, and other offices.

PUBLIC LIBRARY, ACTON.—The American Ambassador, the Hon. J. H. Choate, opened the Acton Free Library on the 3rd inst. The new building is situate on the main road. It is English Renaissance in style, built of red brick and stone. Green slates cover the roof. Sculptured figures flank the entrance, and support the corbels which carry the columns above. On the left is the reading-room, 50 ft. by 30 ft., while to the right is the lending library, which occupies a space of about 45 ft. by 38 ft. Adjoining is the reference-room, which is about 28 ft. by 24 ft. On the other side of the hall is the magazine-room, 26 ft. long and 21 ft. wide, with a lift communicating with the floor above, where the store-room is situate. The librarian's residence occupies the first floor. The building was designed by Mr. M. B. Adams, while Mr. Sidney Powell was the builder.

SANITARY AND ENGINEERING NEWS.

ELECTRICITY GENERATING STATIONS.—Sites in London and the environs for electricity generating stations are scheduled in their Parliamentary Bills by the Metropolitan District Railway at Chelsea Creek, Lot's-road, with a view to adapting their own and the Metropolitan Railway's lines for the use of electrical power; the London County Council, at their tramway depôt, Camberwell New-road, for their tramroad and light railway service, at an estimated cost of 90,000*l.*; the City of London Electric Lighting Company, at Sumner-street, Southwark, taking Nos. 31-3, 51, 65-7, and 73 in that street, together with all the property on the south side of Bankside between the "Waterman's Arms" and Crown Wharf, and Pike-gardens; the Charing Cross and Strand Electric Supply Corporation, seven and a half acres at Pudding Mill-lane, West Ham; and the London and Brush Provincial Electric Lighting Company, at Hill-street, Camberwell, City-road basin of the Regent's Canal, Streatham, and Wandsworth.

HALSTEAD UNION WORKHOUSE, ESSEX.—The Board of Guardians having recognised the expediency of adopting the latest improvements in sanitation and hygiene at their present workhouse, instructed Messrs. Clare & Ross, architects, Chelmsford, to prepare plans for the entire reconstruction of all sanitary arrangements on the water-carriage system, and the disclosures made in carrying out the work only proved how necessary such an undertaking was. Close to the entrance gates a large intercepting chamber has been built on the existing 9-in. sewer, fitted with Kenyon's patent intercepting trap and fresh-air inlet, with mica flap valve fixed in the vicinity. From this point the entire sewerage system is now reconstructed. Inspection chambers are placed at each change of gradient or direction on the main sewer. White glazed half-pipe channels, benched with blue bull-nosed Staffordshire brick, form the open channel through each. To facilitate thorough inspection of the branch sewers, and at the same time obviate unnecessary deep cutting, vertical pipes, outside the brickwork of deep manholes, fitted with proper bends and junctions, connect the high with the low level sewers, and inspection pipes through brickwork, galvanised air-tight covers (rubber joints) prevent any smell arising, while all soil pipes are connected with ventilating pipes carried through the roof. Automatic flushing closets with seat action have been fitted, also automatic flushing cisterns to urinals; these, with new lavatory range in boys' room, are from Messrs. Bowes, Scott, & Western, of Westminster, while Messrs. Doulton & Co., Lambeth, supplied all stoneware pipes, ¾ and ½-pipe channels, bends, &c. All lead wastes from baths, sinks, &c., have been efficiently trapped, and in addition discharge into the white glazed extension arm made for that purpose by the latter firm. The water supply is also new, a 2-in cast-iron main being laid to the boiler-house and storage tanks, but drinking water is laid direct from the main to taps in suitable positions. Mr. Geo. Sharp, of Halstead, was the contractor, and the whole work has been supervised by Mr. J. K. Woodward, as clerk of works. The cost has been 650*l.*

FOREIGN.

FRANCE.—The new Museum of the works of the late Gustav Moreau is shortly to be opened at 14, Rue Rochefoucault, Paris. Moreau left to the State all his collections and his dwelling-house. It contains 500 water-colours and more than 500 drawings and studies. The committee for arranging the building appear to have taken some hints from the Soane Museum in regard to the system of hanging and hinging frames so as to get as much as possible into a limited space.——The Municipality of Clermont-Ferrand are about to open a competition for a Fine Art Museum.—The Société des Architectes de l'Est have elected M. Henri Couty their president for 1900.——The Town of Nimes has devoted a sum of four million francs to the construction of a large hospital built on an amphitheatre plan on the hill of Puech-du-Teil, about a mile and a half out of the town.——The American National Institute has requested from the city of Paris a grant of a site on which to erect a palace corresponding in its object with the Académie de France at Rome and the Ecole Française at Athens. The Municipal Council are understood to be favourable to the scheme.——We have to announce the death of M. Leopold Steiner, sculptor, at the age of forty-six. While still a pupil of the Ecole des Beaux-Arts he obtained an honourable mention in the competition for the memorial of the defence of Paris at Courbevoie. He was also author of the statue of Rouget de l'Isle at Choisy-le-Roi, of that of Ledru-Rollin in the Place Voltaire, of the statue of Berryer for the Chamber of Deputies, and various other important works. His last work was the design for one of the four Pegasus figures which decorate the Alexandre III. Bridge.

MISCELLANEOUS.

SURVEYORSHIP APPOINTMENT.—Mr. Thomas H. Dunch, who has been for the last four years Surveyor to the Board of Works for the Limehouse District, has been appointed Assistant Surveyor to the Barking Town Urban District Council.

SOUTHAMPTON-BUILDINGS.—With the demolition, which has just been begun, of the premises hitherto occupied by the Birkbeck Bank, and of the houses adjacent, nearly all the old houses in Southampton-buildings will have disappeared. The cleared site is taken for a completion of the bank's newly-opened premises, of which Mr. T. E. Knightley is the architect, the terra-cotta work being from Messrs. Doulton's factory. The entire block, when finished, will have a north frontage in High Holborn, on the site of Nos. 326-32, between Staple Inn and Middle Row-place, together with an east frontage to a thoroughfare that is about to be laid out, leading from High Holborn along the west side of Staple Inn and its garden. The offices and chambers on the west side of Southampton-buildings and the east side of Chancery-lane, forming one block, were erected a few years ago upon the Earl of Radnor's estate.

CHANCERY LANE.—The new premises which have been erected for Mr. N. Fortescue in Chancery-lane, occupy in part the site of the old Rolls-chambers. The contractors are Messrs. Dolman & Co., of Poplar, and Messrs. Waterman & Lewis are the architects. The new block comprises a café in the basement floor, four shops on the ground floor, with about sixty-five offices, in sets, on four floors above.

CITY OF LONDON ("VARIOUS POWERS") BILL.—The Corporation of London will apply to Parliament in the ensuing session for an Act to enable them to (1) acquire and maintain the garden of Finsbury-circus as a public open space; (2) purchase, by compulsion or agreement, Spitalfields Market*, and then sell or lease it to the Council of the borough for the parishes of Mile End Old Town, St. George-in-the-East, and the districts of the Limehouse and Whitechapel Boards of Works, including the Tower and its Liberties; (3) further provide in respect of baths and washhouses; (4) establish a crematorium in their cemetery at Little Ilford; and (5) exercise further powers in respect of electrical lighting, telegraphical and similar wires and cables, open spaces, infectious diseases, closets and other sanitary conveniences, the abolition of existing restrictions as to the capacity of water waste preventing cisterns and automatical flushing-cisterns, and the regulation and control of passenger and vehicular traffic and exhibition of advertisements and notices which lead to obstruction in the streets.

LONDON MARKETS, NEW AND OLD.—A Bill will be introduced in the course of next Session for the incorporation of the National Markets, Stores, and Workshops Company, who propose to establish a market for the sale of live stock to be imported from Ireland, and an abattoir, on a site at Glengall-road, adjoining Millwall Dock Basin, Poplar, and another market for dead meat, fish, poultry, fruit, vegetables, and other produce, on a site lying between Great Eastern-street, Curtain-road, and High-street, Shoreditch. The Bill provides for the stopping-up of George, Hearn, and Hewett streets, Bowl-court, and Plough-yard, in the parish of St. Leonard, Shoreditch. Various suggestions have recently been made to the Corporation of London in respect of a much-needed further enlargement of Billingsgate Market, or provision elsewhere for the largely increasing fish traffic. The Billingsgate and Leadenhall Markets Committee, after considering a proposal of the London Riverside Fish Market Company to sell their market at Shadwell to the Corporation, have, we gather, agreed to recommend that in the first place, a lease be taken, with an option to the City of ultimately purchasing the entire interest in the undertaking. It is stated that in terms of the contemplated arrangement the Corporation will incur an outlay of perhaps 10,000*l.*, whilst the company will receive an income from rents and other sources of about 6,000*l.* per annum. The company was incorporated by an Act of 1882, with an authorised share capital of 255,000*l.* For some while their enterprise did not realise the shareholders' expectations, but of late years the financial status of the concern has greatly improved.

STREET IMPROVEMENTS, MANSFIELD.—Lieut.-Col. A. C. Smith, Inspector to the Local Government Board, conducted an inquiry at the Town Hall, Mansfield, on the 28th ult., respecting an application made by the Town Council to borrow the sum of 19,400*l.* for the purposes of street improvement, and also the sum of 1,415*l.* for the purposes of water supply. Mr. Hodson, Engineer, made a statement relating to he construction of the waterworks; and the Deputy Town Clerk (Mr. J. H. White) and the Borough Surveyor (Mr. R. F. Vallance) explained plans relating to the proposed improvements in Leeming-street, Rosemary-lane, and Portland-street.

PRIZES FOR DRAWING.—The Technical Education Board of the London County Council is prepared to award four prizes—two of the value of 15*l.* and two of the value of 10*l.*—for the best sets of careful studies made in museums, old churches, or similar places (South Kensington Museum and the British Museum especially). The drawings may be in pencil, ink, or colour, as best fitted to the subjects represented. The subjects selected may be in several

* The London County Council have framed a Bill for buying the market. The price agreed upon by them is 170,000*l.*, plus 1,250*l.* for negotiation expenses.

classes of work or wholly in one, as, for instance, goldsmiths' work, furniture, stained glass, pottery, ironwork, fine textiles, embroideries, &c. All the drawings should be of imperial size or mounted, two or more together, on sheets of that size. The aim should be to represent the objects as faithfully and carefully as possible, and no mere sketches will be accepted. Fidelity in the drawing will be more highly valued than a large number of sheets. As far as possible the drawings should be of full size, or an actual or approximate scale should be noted, together with any explanatory notes thought desirable. Students are recommended to select objects in the classes of work in which they are most interested, and from Gothic or Eastern examples as much as or more than from those of Renaissance style. The sets which receive prizes will become the absolute property of the Technical Education Board. The last day for submitting drawings in competition for the above prizes will be October 1, 1900. They should be delivered at the Central School of Arts and Crafts, 316, Regent-street, by that date. Special labels may be obtained from the Board's secretary, 116, St. Martin's-lane, W.C., on and after February 1. (The drawings may, if desired, be submitted at the Northampton Institute, Clerkenwell, in competition for the Board's scholarships in February; in that case it will be necessary for them to be sent in to the Central School later on.)

"THE GARDEN."—This excellent horticultural journal starts the new year with an enlarged and improved issue, practically a new series. The proportion of illustrations is considerably increased, and there are some reproductions of pencil sketches of flowers which are a new feature, and are well drawn and reproduced. The list of the principal contributors is a very good one, and includes some names of general distinction, as well as those of specialists in horticulture.

HEREFORD ELECTRIC LIGHTING.—At the monthly meeting of the City Council on Tuesday last week an honorarium of 100 guineas was granted to Mr. John Parker, A.M.Inst.C.E., the City Surveyor, in recognition of the services rendered by him in connexion with the electric light undertaking. At the same time, Mr. F. G. Poulton was appointed resident electrical engineer at a salary of 150*l.* per annum, his duties as clerk of works having expired. In moving the adoption of the Committee's report to the above effect the Mayor explained that Mr. Parker had, at the request of the Committee, designed and carried out the works, which, by the terms of his appointment, he was not bound to do. The outcome was that they had erected these works. Mr. Parker briefly thanked the Council for the manner in which they had recognised his services in connexion with the electric light installation.

AN ACETYLENE EXHIBITION.—The Acetylene Light Syndicate, Limited, of Trowbridge, recently gave a display of acetylene gas-lighting and apparatus in the Corn Exchange, Hungerford. The large hall was illuminated with twelve burners of 50 candle power each, ten of which were fitted to the permanent pendants suspended from the roof, the coal gas having been disconnected, and acetylene laid on in the same way. The clock tower was illuminated with 400 candle power, by simply removing the coal gas burners and replacing them by acetylene gas burners These produced a very brilliant illumination of the clock dials, the light being fifteen times more powerful than that produced by the coal gas jets generally used for the same purpose. The generator for making the acetylene gas was placed in the yard behind the Exchange, and was connected to the different lights in the building by compo pipe. The generator was of the automatic type, and of 1,000 candle power capacity. It had two cast-iron cylinders, in which the carbide of calcium was placed, so that when the carbide in either cylinder becomes exhausted, the automatic action of the apparatus admits water to the other cylinder; in the meantime the exhausted carbide may be removed from the first cylinder without interfering with the lights, should they happen to be burning at the time. The generator had a very massive appearance, being nicely enamelled, and the gas and water taps were made of gun metal. In the large hall several generators were exhibited, showing the different systems adopted by the Acetylene Syndicate for producing acetylene. The gas was not purified, only washed, as the Acetylene Syndicate think it unnecessary, as they, being manufacturers of carbide, take great care that only the most pure materials are used in its manufacture; the analysis of the Syndicate's carbide shows it to be 99·98 per cent. pure.—*Journal of Acetylene Gas Lighting.*

ROMAN VILLA AT BRISLINGTON.—The recent discovery of the site of a Roman villa at Brislington (referred to in our last issue) has created considerable interest amongst antiquaries, and visitors to the locality have been numerous during the past week. The land under which the mosaic pavement was found is the property of the Bristol and District Land Company, Limited. From the interviews which have taken place between individual directors and prominent antiquaries, it was generally understood that the local museum would become richer for the discovery. At a meeting of the Board on the 2nd inst. the subject was discussed, the directors being unanimously of opinion that, while they must, in the interests of the shareholders, reserve their rights as to any further discoveries, the city should, as far as possible, have the benefit of the find, and the secretary was instructed to write to the chairman of the Museum Committee, offering the pavement discovered for removal to the museum, and empowering him to have such further excavations made as may seem desirable, it being the opinion of antiquaries that further and still more interesting discoveries will probably be the result.

ALMANACS, &c. — "The British Almanac and Family Cyclopædia" for 1900 (Charles Letts & Co., 3, Royal Exchange) is the seventy-third year of issue of a handy, neat, and excellent little book of reference. It is full of useful information on a great number of subjects, and contains many explanatory illustrations. — The Patent Victoria Stone Company, Limited, have sent us their folding blotting-pad and date-indicator for 1900. It is a useful publication of its kind.—We have received from Messrs. Ashwell & Nesbit, warming, ventilating, hydraulic, and electrical engineers, their tear-off Shakesperian calender.

ANTIQUARIAN DISCOVERIES AT FURNESS ABBEY.—The antiquarians who have been working about the ruins of Furness Abbey for some time have made a discovery which supplies an interesting link in the history of the abbey. It proves that a small Early Norman Church existed on a portion of the site of the later chapel or sacristy. About 5 ft. from the present surface the eastern foundations of an apsidal chapel have been unearthed. The later and larger building had a floor level 2 ft. 6 in. higher than the floor of the old chapel, raised possibly on account of the old floor proving damp, and this has caused these interesting relics of the past to be preserved to the present time. Another most interesting find was a mass of human bones, lying in a promiscuous heap 3 ft. in thickness, and these were cut through by the trench which has cleared the foundations above referred to. The excavations will be continued until a plan of this hitherto unknown early Christian church is secured.—*Yorkshire Post.*

CAPITAL AND LABOUR.

CARPENTERS AND THEIR WAGES, TROWBRIDGE.—The Trowbridge Society of Carpenters and Joiners have given the Master Builders' Association notice for an advance in wages of one penny per hour, to date from the first week in June next. The present wage is 5½d. per hour.

RECENT PATENTS:

ACCEPTED SPECIFICATIONS.

Open to Opposition until March 3.

[1898] 20,645, Maussner, Fire- and Water-proof Material. 27,380, Phillips, Machines for Making Window-stile Pockets. 27,416, Clay, Incandescent Gas Burners. 27,541, Wakelin & Weston, Detachable and Swivelling Electric Light Fittings. [1899] 43, Errington, Tapping, Drilling, and similar Machines. 153, Monnard, Dynamo Electrical Machines or Motors. 903, Eckstein & Guthrie, Telephone Exchange Switch-boards. 1,411, Le Blanc, Treatment of Street Sweepings and Scrapings and Town Refuse. 2,172, Sugg, Supports for Mantles used for Incandescent Lighting. 2,428, Gover & Huisman, Electrical Switches. 2,429, Wrigley, Step Ladders. 2,672, Pitkin & Thompson, Making Expanded Metal Work. 2,832, Chandlers, Apparatus for Washing or Scrubbing Gas. 3,077, Ingham, Method of Ventilating Chimney-pots, Chimney-stacks, and Buildings. 3,259, Boyce, Chimney-pots. 3,426, Brown, Joint for Spigot and Socket-pipes. 3,555, Elsbach & Pollini, Devices for Automatically Igniting Combustible Gas. 3,599, B. Mountain & Son and Armistead, Nails and Rivets. 3,641-2, Davidson & Wilson, Governing Apparatus for Impulse Water Motors, and Nozzles for Water Motors. 3,795, Summers, Reversible Seats for Out-door Use. 3,796, Anderson, Stone-sawing Machinery. 4,124, Dowsing, Electrical Stoves. 4,194, Wadsworth, Dust Carts. 4,211, Markham, Handles for Hatchets, Adzes, Hammers, and similar Tools. 4,427, Von Kosinski, Apparatus for Drying newly-erected Buildings. 4,460, Whittaker & Bryant, Filters or similar Appliances for Use in Treating or Purifying Sewage. 4,560, Haws, and 14,795, Snyder & West, Acetylene Gas Lamps. 6,512, Parratt & Marsh, Tools for Expanding, Cutting, and Beading the Ends of Tubes: see also 19,747. 13,556, Perlich, Self-Igniting Gas Burner. 14,207, Benard, Telephone Apparatus. 17,576, Waage, Making Profiled Polygonal Articles of Wood. 18,874, Weber-Marti, Device for Opening and Closing Low-Pressure Conduits for Gas or other Fluid or Liquid from a Distance. 19,354, Timar, Thermophor with Electrical Heating Arrangement. 19,747, Angström, Tube Expanding Tools. 20,753, Biheller, Lanterns or Globes for Incandescent Gas Lights, &c. 20,929, de Bruyn, Artificial Building-Blocks. 20,936, Metz, Ceramic Ware, Moulded Articles, Panels, Cornices, &c. 21,260, Caldwell, Wood and similar Screws and Screwed Shanks. 21,789, Bolens, Grinding and Sharpening Machines. 21,968, Drohan, Arc Lamps and Roller Clutch Mechanism for Feeding and Controlling the Electrodes in them. 22,088, Steinmetz, Incandescent Electrical Lamps. 22,257, Harter, Mounting Electrical Lamps. 22,389, Lewis, Production of Acetylene Light. 22,516, Stern, Regulated Liquid Trap for the Gas Delivery Pipes of Acetylene Gas Generators. 22,527, Gebrüder Buxbaum, Apparatus for Carburetting Air or Producing "Air-Gas." 22,534, Steinmetz, Generation of Alternating Electrical Currents. 22,714, Straub, Plaster, Cement, &c. 23,045, Forir, Folding Ladders and Scaffolding. 23,283, Thomson, and 23,291, Steinmetz, Systems of Electrical Distribution. 23,285, Rice, and 23,288, Wiswell, Electrical Arc Lamps. 23,459, Kessel, Insulating Coverings for Steam Pipes. 23,502, Jenner, Apparatus for Raising Water and Converting it into available Power. 23,728, Wuillot, Lead Plates for Secondary Batteries. 23,732, Murphy & Arnold, Gas Valves or Stop Cocks. 23,845, Fromholt, Means and Apparatus for Sawing Stone or other Hard Substances.

ABSTRACTS OF PATENTED INVENTIONS.

19,190.—HANGING OF CHURCH AND SIMILAR BELLS: *W. F. Aggett.*—A projection of the base fits loosely into a recess of the bush, which is sphere-shaped and has flattened ends, so that the bush is in alignment with the spindle, and may be reversed in position by means of a similar recess formed in its opposite side; the bush's rocking with the bell is prevented by forming the projection upon the base's cover, and lengthening the recesses to closely fit it.

19,251.—MOULDING BRICKS: *W Ormrod and F. W. Wild.*—The invention is designed to avoid handling of the bricks when they are in a soft state, the stream of clay as it emerges from the pug-mill is driven by a push-board through knives or cutting wires on to a shelf, and thence on to the truck's smooth table, which is level with the shelf.

19,252.—WATER HEATERS FOR BATHS, &c.: *A. H. Humphrey.*— A sprinkler distributes water over a cone within the heater, whence the water falls upon the outer surface of a lower truncated cone, and so down to the outlet cock; gases from the burner rise up within the two cones and pass away through the flue.

19,261.—SELF-EXTINGUISHING LAMPS: *F. Sander* —A vessel containing water receives the oil reservoir which may either float therein or be supported by a collar, should the lamp be upset the escaping water will extinguish its flame; the reservoir is adapted to stand upon a flat surface.

19,273.—CHECK AND BALL-AND-FLOAT VALVES: *A. Barraclough.*—The float lever consists of two arms pivotted together, a screw which engages with either a nut in the lever's forked end or a projection thereon, serves to adjust the height to which the float rises, a conical flexible check valve admits air into the cistern supply pipes.

19,328.—CLUTCH FOR ROPES: *N. Seidner.*—On the frame is a fixed jaw, between which and a set of variously-sized jaws, arranged as a star-wheel, the rope is gripped; the slide, upon which the star-wheel is mounted, is lowered by means of an incline attached to the track, and is then secured with a spring bolt that works through a key-hole slot; for freeing the rope another fixed incline drives the bolt inwards, when its recessed portion falls into line with the narrow part of the slot and enables the springs to lift the jaws and the slide.

19,368.—BOILERS FOR DOMESTIC AND OTHER PURPOSES: *G. Whittaker.*—The boiler consists of a non-conducting casing in which a metal lining is held by means of a flange around its upper edge; a vertical tube from the boiler cover is joined to the flue and is fitted with a steam regulator or damper, which is operated either by hand or automatically by the steam.

19,398.—REGENERATIVE GAS LAMPS: *W. K. Stent.*—The air, after having been heated on its descent between the concentrical chimneys of an argand burner, is divided by an interposed burner cone, which is so arranged in relation to the openings that about one-third of the volume of air supply rises upwards within the inner chimney, in order to obviate the deposit thereon of soot and other matter.

19,403.—TRIANGLES FOR DRAUGHTSMEN'S USE: *F. Ziegler.*—The invention applies to triangles or squares for setting off repeatedly small angles in drawing plans and for similar purposes; the triangle is fashioned so that it will give three small angles, x, y, and z, which are, respectively, the differences of its three angles X, Y, and Z, and the tangents of the angles x, y, and z are marked upon the triangle; for an example of use, a side c is laid upon a line A B, and a rule is laid against the side b, the triangle is then turned over so that its side a lies along the rule and its side b assumes a fresh position, whereupon the second position of the side c shows the desired angle x with the line A B, and if the angle x = the angle y, the angle z would be equal to $2x$; a double switch is set-off by laying the side c along the line A B, turning the triangle until its side c rests upon the rule, and again turning it until the side b lies upon the rule;

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, and not included in this List, see last week's issue.)

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c., Supplied by	Tenders to be delivered
Flagging, Kerbing, &c., Upper Dock-street	Fleetwood U.D.C.	E. Frobisher, C.E., Town Hall	Jan. 16
Court House, &c., Malton, Yorks.	do.	County Surveyor, Northallerton	do.
Sewerage Works	Bury (Lancs.) Corporation	Borough Surveyor, Bank-street	do.
Pipe Sewers, &c.	Gomersal (Yorks.) U.D.C.	J. Waugh, C.E., Sunbridge Chambers, Bradford	do.
*Furnishing New Coal Clough Schools	Burnley School Board	W. A. Quarmby, Imperial Chambers, Grimshaw-street, Burnley	Jan. 17
Buildings at Gasworks	Scunthorpe (Lincs.) U.D.C.	Stevenson & Burstal, Engr., 38, Parliament-street, S.W.	do.
Road Works, Whitford-road, Tranmere	Birkenhead Corporation	C. Brownridge, C.E., Town Hall	do.
Public Conveniences, &c., Pottery Quay	Devonport Town Council	J. F. Burns, Boro. Surv., Municipal Offices	do.
Electricity Station	Harrogate Corporation	S. Stead, Boro. Surv., Municipal Offices	do.
Street Works, Kingsland-road, Boxmoor	Fulham Vestry	W. R. Locke, Boro. Surv., Town Hall	do.
*Making-up and Paving Felden-street (Section II.)	St. Marylebone Vestry	C. Botterill, Town Hall, Walham Green, S.W.	do.
*Carting Away Slop and Sweepings	do.	Court House, St. Marylebone, W.	Jan. 18
*Watering Streets and Roads	Mr. J. Hall	do.	do.
Alterations to 22 & 23, King-street, Bridlington Quay	Axbridge R.D.C.	J. Earnshaw, Archt., Wellington-road, Bridlington Quay	do.
Road Materials, &c.	Isle of Thanet R.D.C.	G. Cook, Surv., Axbridge, Weston-super-Mare	do.
Sewerage Works, Garlinge	Falkirk Burgh School Board	A. Latham, C.E., Municipal Buildings, Margate	do.
School, Victoria-road	Leeds Corporation	A. & W. Black, Archt., Falkirk	do.
Walling, &c., Recreation Ground, Burley	Stourbridge, &c., Hospital Comte.	City Engineer, Municipal Buildings	Jan. 19
Hospital, Hayley Green, Lutley	Hull Corporation	A. T. Butler, Archt., High-street, Cradley Heath	do.
Disinfecting Station, Scarborough-street	Uckfield U.D.C.	A. E. White, Engr., Town Hall	do.
*Concrete Paving	Sheffield Union	Council Offices, Public Hall Chambers, Uckfield	Jan. 20
Home, Laundry, &c., Fir Vale	Manchester Corporation	E. W. Mountford, Archt., 17, Buckingham-street, W.C.	do.
Culvert, Moston Brook	Hull Corporation	City Surveyor, Town Hall	do.
House, Ashburton, Devon	Kidderminster Corporation	Whiteway & Foot, Ashburton	do.
Public Library, Albion-street	London County Council	J. S. Gibson, Archt., 4, Gray's Inn-square, W.C.	do.
Additions to Hospital	Great Western Railway	A. Comber, Boro. Surv., Town Hall	Jan. 22
Road Making, Pound's Estate, Plymouth	do.	J. Paton, Boro. Engr., Plymouth	do.
Alterations, &c., to Buildings, Frizington, Cumberland	Tottenham U.D.C.	W. Labourne, Yeathouse-road, Frizington	do.
*Wrought-Iron Hurdle and Wire Fencing	do.	Parks' Department, 9, Spring-gardens, S.W.	Jan. 23
*Offices, &c.	Lewisham Board of Works	Engineer's Office, Paddington Station, W.	do.
Station Buildings, &c., Devonport	Ramsgate Corporation	G. K. Mills, Paddington Station, W.	do.
*Constructing a Sewer	North Eastern Railway Co.	P. E. Murphy, 712, High-road, Tottenham	do.
*Construction of Sewer and Removal of Syphon	Knutsford U.D.C.	do.	do.
*Public Lavatories, &c.	St. Pancras Vestry	Surveyor's Department, Lewisham Town Hall, Catford, S.E.	do.
*Wood Paving	St. Anne's-on-Sea U.D.C.	T. G. Taylor, Broad-street, Ramsgate	Jan. 24
Fifty Houses, Heaton, Newcastle-on-Tyne	Beckenham U.D.C.	W. Bell, Archt., Central Station, Newcastle-on-Tyne	do.
*Cemetery Chapel, &c.	Horsham Burial Joint Committee	R. J. McBeath, Birnam House	Jan. 25
*Public Baths and Wash-houses	Stratford-on-Avon Town Council	T. W. Aldwinckle, 1, Victoria-street, S.W.	Jan. 26
Additions, &c., to Hotel, near Marazion	Mr. J. F. Jones	A. C. Jenkin, 3, Parade-passage, Penzance	Jan. 27
Street Works, St. Anne's-road East, &c.	Whitechapel Board of Works	T. Bradley, Park-road, St. Anne's-on-Sea	do.
*Making-up Phœnix-road, Penge	Hornsey U.D.C.	J. A. Angell, Council Offices, Beckenham	Jan. 29
*Cemetery, Chapels, and Curator's Lodge	Wandsworth Board of Works	C. H. Burstow, 6, West-street, Horsham	do.
Concrete Wall, &c., Bancroft Gardens	Chelsea Vestry	R. Dixon, C.E., Municipal Offices	do.
Fifteen Houses, Church-street, Ebbw Vale, Mon.	Great Yarmouth Town Council	James & Morgan, Archt. Charles-street Chambers, Cardiff	do.
*Sanitary Works	Sheffield Corporation	W. Jameson, 15, Great Alie-street, Whitechapel, E.	do.
*Sewering, Levelling, Paving, &c.	Burton-on-Trent Corporation	E. J. Lovegrove, Council Offices, Southwood-lane, Highgate, N.	Jan. 30
*Works and Materials	City of Sheffield	Board of Work's Office, East Hill, Wandsworth, S.W.	do.
*Articles and Works	Wimbledon U.D.C.	Clerk and Surveyor (see Advertisement)	do.
Steam Tramway Rails	West Ham Union	J. W. Cockrill, C.E., Town Hall	do.
Artisans' Dwellings, near Townhead-street	North Eastern Railway	C. F. Wike, C.E., Town Hall	Jan. 31
Cottages, Street Works, &c.	Hucknall Torkard Indus. Prov. Soc.	G. T. Lynam, Boro. Engr., Town Hall	do.
Rebuilding Star Inn, Keighley	Mr. A. Bellhouse	Jackson & Fox, Archt., 7, Rawson-street, Halifax	do.
*Working-Class Dwellings	Messrs. Dennis Bros.	C. F. Wike, Town Hall, Sheffield	do.
*Corrugated Iron Roof		C. H. Cooper, The Broadway, Wimbledon	Feb. 5
*Electric Lighting Plant, &c.		Clerk's Office, Union Workhouse, Leytonstone, E.	Feb. 7
*General Offices		W. Bell, Archt., York	do.
Business Premises, Kimberley, Nottingham		F. E. L. Harris, Archt., Co-op. Wholesale Soc. Ltd., Manchester	No date
Rebuilding Adelphi Hotel, Dock-street, Leeds		T. Winn, Archt., 92, Albion-street, Leeds	do.
Factory, Bridge-street, Guildford		J. Lake, Archt., Bridge-street, Guildford	do.
Workshop, West Dock-avenue, Hull		E. Whitlock, Archt., 26, Scale-lane, Hull	do.
Villa, Dorstone, Herefordshire		W. W. Robinson, Archt., Hereford	do.
Farm Buildings, Skinner Hill, near Grange-over-Sands		T. R. Wilson, Lindale, Grange-over-Sands	do.
Rebuilding Hotel, York-street, Leeds		Bromet & Thorman, Archt., Tadcaster	do.
Road Works, &c., Moore-street, Rochdale		McCall & Robinson, Vicarage Estate Office, Rochdale	do.
Alterations to Property, Harrogate	Mr. C. H. Burgess	H. E. & A. Bown, Archt., James-street, Harrogate	do.
Additions to Hotel, Harrogate	Mr. W. Bartram	do.	do.
Cottage Hospital, &c., Selby		T. B. Thompson, Archt., 15, Parliament-street, Hull	do.
Seven Houses, Burnley-road, Padiham		Hitchon & Pritchard, 46, Manchester-road, Burnley	do.
Foundations, 7 Houses, Sandyford Estate, Newcastle		Hope & Maxwell, Archt., Trinity Buildings, Newcastle-on-Tyne	do.

APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*Clerk of Works	Romford Union	3l. 3s. per week	Jan. 15
*Buildings' Inspectors (2)	Tottenham U.D.C.	150l. per annum	Jan. 22
*Clerk of Works	do.	2l. 10s. per week	do.
*Clerk of Works	Willesden Guardians	4l. 4s. per week	Jan. 23
*Building Inspector and Clerk of Works	Borough of Tynemouth	2l. 10s. per week	Jan. 24
*Building Inspector	Southend-on-Sea Corporation	125l. per annum	Feb. 2
*Junior Assistant	Borough of Tynemouth	30s. per week	No date

Those marked with an asterisk (*) are advertised in this Number. *Competitions, p.* —. *Contracts, pp.* iv. vi. viii. x. & xix. *Appointments, pp.* xvi. & xix.

in one shape of the triangle, one of its angles is a right angle, thus the complement of the small angle can be drawn.

19,422.—TRACING THE PROFILE OF A TRAVELLED PATH: *P. Weber.*—The recording strip is made to pass from a spool over a table and an adjustable pressure roller to another collecting spool which is driven by a cord attached to the roller—the roller being geared to a wheel of the travelling vehicle. The points of the tracing wheels are received by a leather band which moves together with the recording strip; a band passing over pulleys carries a pendulum weight, its lateral motion being prevented by a guide-rod which also serves to support the weight should the band be accidentally snapped. The middle of the band is fastened to a block which slides—at right angles to the paper's plane—in an arm pivotted by a vertical axis in the top case or cylinder and carrying the tracing wheel's axis freely. When the vehicle passes from a horizontal position, the arm which carries the tracer swings upon its pivot, so that the tracing wheel assumes a position inclined to the direction of the strip's movement, and as it rolls, will travel along its axis and trace a line whose angle of inclination in respect of the sides of the strip will vary in accordance with the gradient of the path travelled over.

19,479.—SELF-CLOSING WATER-TAP: *W. Lange.*—An india-rubber sack, pressing against a spring inside the cap, closes the tap's outlet, the working lever being pivotted to the cap; a cock is added for purposes of repair, and leakage is avoided by means of the sack being fastened between the casing and the cover.

19,568.—PARQUETRIE FLOORING: *G. Isler.*—In order to deaden sound, strips or plates of cork and peat are fastened on to the backs of the parquetrie blocks, extending to their edges; the contrivance is designed also to ensure absorption of damp, and to dispel the accumulation of harmful matter.

19,579.—CEMENT FOR ARTIFICIAL STONE, &C.: *F. W. Butler.*—A magnesian cement for making artificial stone, mill-stones, hones, grindstones, and similar articles is composed of an admixture of Grecian or Eubœan magnesite, calcined and powdered, and chloride of magnesium—the mass being heated together with the ashes of anthracite or bituminous coal. Small parts of aluminium or potassium sulphate and dry soap are then added.

19,607.—VENTILATION OF WATER-CLOSET BASINS: *H. Kerrill.*—The jet from the ball-cock drives a fan which is mounted, within the flushing cistern, above the flushing-pipe, through which latter foul air is exhausted from the basin to be forced out through an opening in the cistern's top.

19,608.—CIRCULAR-SAW GUARDS: *F. Scott.*—Two or more plates, sliding the one within the other, are carried upon a horizontal arm, which can be lowered or raised by means of a screw between the two sides of a double pillar or support; the riving knife is joined to the underside of the bench with a screw and slot, and at its top to an adjustable slide.

19,633.—A COATING MATERIAL TO IMITATE STONE: *G. Collantier.*—The compound is intended for application to brick, metal, wood, stone, and other surfaces; it is made by mixing linseed oil, turpentine, clear oil varnish, water, a dryer, and white lead crushed with oil, with powdered gravel, carbonate of lime, pumice, talc, and phosphate of lime; after it has been laid on with a brush, and has begun to set, it is rolled over with an elastic roller that it may assume a regular grain; the surface, when hardened, is finished with a rubbing of dry sandstone or gravel; the grit, white lead, and dryer are omitted if mouldings or sculptured work are to be treated with the composition.

MEETINGS.

FRIDAY, JANUARY 12.

Architectural Association.—Mr. Arthur Bolton on "The Dome as the Basis of an Architectural System," illustrated by measured drawings of Italian churches. 7.30 p.m.

Glasgow Architectural Craftsmen Society.—Mr. H. F. Bladen on "Structural Work of Theatre Auditoriums." 8 p.m.

Institution of Civil Engineers (Students' Meeting).—Address by Professor T. Claxton Fidler on "The Theory of Structures and Strength of Materials." 8 p.m.

SATURDAY, JANUARY 13.

Dundee Institute of Architecture.—Visit to Perth.

MONDAY, JANUARY 15.

Surveyors' Institution.—Mr. John Nisbet on "Forest Management, with suggestions for the Economic Treatment of Woodlands in the British Isles." 8 p.m.

London Institution.—Dr. J. A. Fleming, M.A., on "Æther and Atoms," with experiments. 5 p.m.

TUESDAY, JANUARY 16.

Institution of Civil Engineers.—Papers to be further discussed: (1) "The Purification of Water after its Use in Manufactories," by Mr. Reginald A. Tatton; and "Experiments on the Purification of Waste-Water from Factories," by Mr. W. O. E. Meade-King. (2, time permitting), Mr. J. A. Saner on "Swing-Bridges over the River Weaver at Northwich." 8 p.m.

WEDNESDAY, JANUARY 17.

British Archæological Association.—Mr. Cecil Davis on "Zoology represented on Monumental Brasses in Gloucestershire." 8 p.m.

Society of Arts.—Mr. Arthur Rigg on "Ventilation without Draughts." 8 p.m.

St. Paul's Ecclesiological Society.—Paper by Mr. J. Grimshire entitled, "Some of the Northern and Eastern Cathedrals of England, including Durham, Lincoln, Ely, and Peterborough." Illustrated by limelight views. 7.30 p.m.

Institution of Mechanical Engineers.—Graduates' visit to the Royal Arsenal, Woolwich.

Builders' Foremen and Clerks of Works' Institution.—Annual meeting of the members. 8 p.m.

Northern Architectural Association.—Mr. Algernon Barker, B.A., on "Legal Topics of Interest to Architects and Surveyors." 7.30 p.m.

THURSDAY, JANUARY 18.

Institution of Junior Engineers (Technical College, Leonard-street, City-road).—Professor W. E. Dalby, M.A., on "The Balancing of Engines." With Experiments. 8 p.m.

FRIDAY, JANUARY 19.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. J. Castell-Evans, F.I.C., on "Mechanical Physics; Laws of Motion, &c." 8 p.m.

Institution of Civil Engineers.—Students' visit to the Hydraulic Installation at Somers Town Goods Depôt, and to the Kentish Town Locomotive Sheds of the Midland Railway, where a new American goods engine will be inspected. 2 p.m.

SATURDAY, JANUARY 13.

Architectural Association of Ireland.—Visit to the Dublin Bread Company's new premises, Sackville-street, 2.30 p.m.

PRICES CURRENT OF MATERIALS:

WOOD.*

Per Petersburg standard hundred.

	£	s.	d.	£	s.	d.
White Sea: first yellow deals	18	0	0	21	10	0
Second do.	16	0	0	18	0	0
Third do.	13	10	0	15	0	0
Battens, 40s., 30s., and 15s. less respectively.						
Petersburg: first yellow deals	15	0	0	17	10	0
Second do.	12	0	0	13	10	0
Battens, 30s. and 20s. less respectively.						
Petersburg, white deals	10	10	0	12	10	0
Do. white battens	9	0	0	10	0	0
Riga, white deals	9	10	0	10	10	0
Swedish mixed yellow deals	16	0	0	18	0	0
Third do.	14	0	0	16	0	0
Fourth do.	12	0	0	13	0	0
Fifth do.	11	0	0	12	0	0
Battens, 30s., 20s., and 10s. less respectively.						
Whitewood, 10 to 20 per cent. less.						
Finnish unsorted yellow deals	11	0	0	11	10	0
Battens, 10s. and 5s. less respectively.						
Whitewood, 5 to 10 per cent. less.						
Norwegian second yellow battens	8	0	0	8	10	0
Third do.	7	15	0	8	0	0
Fourth do.	7	10	0	7	15	0
Whitewood, 10s. less.						
Danzig, Crown Deck deals, per 40 ft. 3 in.	0	15	0	1	5	0
Brack	0	12	0	1	0	0
St. Lawrence Pine deals, &c., per P.S.H.:—						
1st, Bright and Dry, regular sizes	20	0	0	27	0	0
" " oddments	13	0	0	20	0	0
2nd " regular sizes	15	0	0	17	10	0
" " oddments	10	0	0	14	0	0
3rd " regular sizes	9	0	0	11	0	0
" " oddments	7	10	0	9	10	0
4th " regular sizes	8	0	0	9	0	0
" " oddments	7	0	0	8	10	0
St. Lawrence Spruce deals, &c.						
First, regular sizes	9	10	0	12	10	0
Second "	9	0	0	9	10	0
Third "	8	15	0	9	0	0
Fourth "	8	0	0	8	10	0
Oddments and battens at 20s., 10s., 7s. 6d., and 5s. less respectively.						
New Brunswick Spruce deals, &c.	8	10	0	9	0	0
Oddments, battens, and fourths	8	0	0	8	10	0
United States pitch pine planks and boards	10	0	0	13	0	0
Prepared Boards, per square						
1¼ by 6½ and 7 in. 1st yellow		10	0		15	0
" " 2nd "		9	6		12	0
1 by 6½ and 7 in. 1st "		9	6		11	0
" " " white		8	0		9	6
" " 2nd yellow		8	0		10	0
" " " white		7	0		8	0
¾ by 6½ & 7 in. 1st & 2nd yellow		7	9		9	0
" " " white		7	6		8	6
¾ by 6½ and 7 in. 1st yellow and white (grooved, tongued, and beaded)		8	0		9	6
¾ by 6½ and 7 in. 2nd yellow and white (ditto)		7	6		8	6
⅝ by 6½ and 7 in. 1st yellow and white (ditto)					7	6
⅝ by 6½ and 7 in. 2nd yellow and white (ditto)		6	0		7	0
Narrower widths at 10 per cent. less. 3rd quality at 15 per cent. less than 2nd.						
Danzig and Memel Fir Timber— per load						
Best middling	3	15	0	4	0	0
Good middling and Second	3	5	0	3	10	0
Common middling	3	0	0	3	5	0
Undersized	3	0	0	3	5	0
Swedish and Norwegian Balks	2	10	0	2	15	0
Baltic Oak Timber—						
Danzig and Stettin—Large	3	5	0	4	5	0
Small	2	10	0	3	5	0
Quebec Timber per load						
Yellow Pine	4	15	0	6	5	0
Oak	4	12	6	6	15	0
Elm	4	2	6	4	7	6
Ash	3	7	6	4	2	6
Birch	3	7	6	5	15	0
New Brunswick, &c., Birch	3	2	6	3	12	6
American Pitch Pine Timber	3	17	6	4	10	0
Wainscot, per log, 18 cubic ft.—						
Crown (Eng. & Dutch) } nominal	3	7	6	4	10	0
Brack } nominal	2	12	6	3	12	6
Lathwood, per cubic fathom—						
Petersburg	4	0	0	6	10	0
Riga and Danzig	4	10	0	5	10	0
Norway Poles, per ft. run	0	0	1	0	0	1½
Oak Staves, per mille full size pipe						
Memel, Crown	220	0	0	230	0	0
Brack	190	0	0	200	0	0
Danzig	165	0	0	175	0	0
Bosnia, single Barrel (nominal)	28	0	0	30	0	0

* The prices named are for the wood as imported and anded in the docks. Ten per cent., approximately, should be added in order to arrive at the current trade prices.

PRICES CURRENT—*continued.*

	£	s.	d.	£	s.	d.
United States, Pipe	37	10	0	45	0	0
Hogshead, extra heavy and double extra	32	0	0	35	0	0
Indian Teake per load	11	10	0	17	0	0
British Guiana Greenheart	0	0	0	8	0	0
Mahogany, per foot superficial—						
Honduras, cargo average	0	0	5	0	0	6½
Nicaragua, do.	0	0	4½	0	0	5½
Tabasco, do.	0	0	4½	0	0	6½
Mexican, do.	0	0	4	0	0	4½
Panama, do.	0	0	3	0	0	4
African, do.	0	0	3½	0	0	5½
Cuba, do.	0	0	6	0	0	8
St. Domingo, do.	0	0	5	0	0	7½
Do. Curls (good to prime)	0	0	9	0	1	3
Walnut, American (logs)	0	2	3	0	4	6
Do. do. (planks and boards)	0	2	0	0	3	6
Italian, per foot superficial	0	0	3	0	0	7½
Black Sea, per ton	6	0	0	12	0	0
Satin Walnut (logs) per foot cube	0	1	0	0	1	3
" (planks and boards)	0	2	0	0	2	9
Sequoia (Californian redwood), per foot cube	0	1	9	0	2	0
Whitewood, American (logs)	0	1	3	0	1	6
" " (planks and boards)	0	1	6	0	2	9
Quartered oak " " "	0	2	3	0	4	0
Kauri pine (logs)	0	1	9	0	3	0
" " (planks)	0	2	3	0	2	9
Jarrah (planks)	0	2	0	0	2	3
Lancewood spars each, fresh and large	0	5	0	0	8	0
Lancewood spars, ordinary to fair	0	4	0	0	5	0
Degame spars	0	8	0	0	10	0

METALS.

IRON—Pig, in Scotland ton	3	6	10	0	0	0
Bar, Welsh, in London	9	0	0	9	15	0
Do. do. at works in Wales	8	10	0	9	0	0
Do. Staffordshire, in London	9	15	0	11	15	0
COPPER—British cake and ingot	75	10	0	76	10	0
Best selected	76	10	0	77	10	0
Sheets, strong	80	0	0	82	0	0
Chili bars	70	0	0	0	0	0
YELLOW METAL lb.	6½d.			7d.		
LEAD—Pig						
Spanish ton	16	15	0	0	0	0
English Com. Brands	17	0	0	0	0	0
Sheet, English, 6 lbs. per sq. ft. and upwards	18	0	0	0	0	0
Pipe	18	10	0	0	0	0
ZINC—English sheet ton	25	0	0	0	0	0
Vieille Montagne	26	0	0	0	0	0
Spelter	20	12	6	20	15	0
TIN—Straits	112	10	0	0	0	0
Australian	112	15	0	113	0	0
English Ingots	116	0	0	117	0	0
Banca	0	0	0	0	0	0
Billiton	0	0	0	0	0	0

OILS.

Linseed ton	24	2	6	0	0	0
Cocoanut, Cochin	29	15	0	0	0	0
Do. Ceylon	26	15	0	0	0	0
Palm, Lagos	27	10	0	0	0	0
Rapeseed, English, pale	24	15	0	0	0	0
Do. Brown	23	5	0	0	0	0
Cottonseed ref.	19	10	0	20	0	0
Oleine	17	5	0	19	5	0
Lubricating U.S.	0	8	0	0	0	0
Do. Black	0	7	6	0	0	0
TAR—Stockholm barrel	1	6	6	0	0	0
Archangel	1	0	0	0	0	0
Turpentine	38	5	0	0	0	0

BRICKS, &c.

	s.	d.		
Hard Stocks	36	6	per thousand alongside, in river.	
Rough Stocks	32	6	"	"
Grizzles	32	6	"	"
Smooth Bright Facing Stocks	62	0	"	"
Fletton	31	6	"	at railway depôt.
Red Wire Cuts	34	0	"	"
Best Fareham Red	71	6	"	"
Best Blue Pressed Staffordshire	86	0	"	"
Best Stourbridge Fire Bricks	84	0	"	"
Best White Glazed Bricks—Headers and Stretchers	240	0	"	"
Best Dipped Salt Glazed—Headers and Stretchers	220	0	"	"
Seconds Quality White and Salt Glazed	40	0	per thousand less than best.	

	s.	d.	
Thames and Pit Sand	7	0	per yard, delivered.
Thames Ballast	6	0	" "
Best Heavy Portland Cement	36	0	per ton "
Best Ground Blue Lias Lime	23	0	" "

NOTE.—The cement and lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime 12s. 6d. per yard, delivered.

STONE.

	s.	d.		
Ancaster in blocks	2	0	per ft. cube, deld. rly. depôt.	
Beer "	1	7	"	"
Grinshill "	1	10	"	"
Red Gorsehill in blocks	2	5	"	"
Red Mansfield "	2	4½	"	"
Hard York "	2	10	"	"

TILES, SLATES.

	s.	d.		
Best plain red roofing tiles	40	6	per 1,000 at rly. depôt.	
hip and valley tiles	3	6	per doz.	" "
Best Broseley tiles	46	6	per 1,000	" "
hip and valley tiles	3	8	per doz.	" "

in.	in.	£	s.	d.		
20	10 best blue Bangor	11	5	0	per 1000 of 1200 at ry. dep	
16	8 " "	6	2	6	"	"
20	10 best unfading green	11	0	0	"	"
16	8 " "	6	12	0	"	"

TO CORRESPONDENTS.

R. C. Q. (Amounts should have been stated.)

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TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 10 a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BLAENTYLERY.—For erecting new mixed school at Blaentylery, Abertillery, Mon., for the Aberystruth School Board. Mr. R. L. Roberts, architect, Victoria Chambers, Abercarn, Mon. Quantities by architect :—

Jno. Linton	£2,900 0 0	W. Phillips	£2,580 0 0
Thomas & Co.	2,800 0 0	Gaen Bros.	2,545 18 7
Davies Bros.	2,718 1 6	Bagley & Co., Abertillery*	2,467 1 3
A. P. Williams	2,700 0 0		

GILDERSOME (Yorks).—For the erection of sheds, lamp-room, &c., for the District Council. Messrs. T. A. Buttery and S. B. Birds, architects, Queen-street, Morley :—

Masonry.

Thomas Holdsworth, Gildersome	£189 4 9

Joinery.

J. Grayshon, Gildersome	56 9 1

Plumbing.

J. Wilby, Gildersome	10 18 0

Slating.

Atkinson & Son, Leeds	29 10 0

GOSPORT. — For additions and alterations to the "Victory" public-house, Forton-road, Gosport. Mr. Harry A. F. Smith, architect, Star-chambers, Gosport :—

Hy. Jones	£875	C. M. Dash	£819
Lear & Son	829	Middelton & Co.*	792
Jno. Croad	825		

HASTINGS.—For the supply of Guernsey granite or basalt road metal, for the Corporation. Mr. P. H. Palmer, C.E., Town Hall, Hastings :—

	Per ton. s. d.
J. Runnalls, Penzance*	12 10

KELTY (N.B.).—For the erection of a police-station, for the Fife County Council. Mr. David Henry, architect, Church-square, St. Andrews :—

Brickwork.—J. Miller & Sons, Cowdenheath	£265 0 0
Joinery.—J. & W. Halley, Kelty	213 0 0
Plumbing.—John Miller, Dunfermline	69 17 6
Plastering.—Joseph Lough, Blairadam	59 8 0
Slating.—Joseph Lough, Blairadam	36 12 11
Cell Doors, &c.—Smith, Sons, & Co., Birmingham	22 18 9

LONDON.—For the erection of laundry buildings, boiler-house, chimney-shaft, &c., at St. Anne's Home, Streatham Hill, for the Guardians of the Poor of St. Pancras. Messrs. Salter, Issott, & Salter, architects, 13, Phœnix-street, St. Pancras. Quantities by Mr. A. R. Henderson, 47, Pall Mall :—

W. H. Lorden	£4,895	W. S. Beaton	£4,023
Smith & Sons	4,682	Gough & Co.	3,784
B. Nightingale	4,273	W. H. Critcher	3,683
A. Bush	4,095	T. G. Sharpington	3,673

STAMULLEN (Ireland). — For additions, &c., to parochial house, Preston-hill, for the Rev. W. J. Davis. Messrs. Anthony Scott & Son, architects, William-street, Drogheda :—

J. Reid	£530	P. J. Caffrey	£352
F. Sogorty	410	M. Henry, Balbrigan*	335
L. Madden	370		

[Stones, sand, and cartage supplied.]

SULLY (Glam.).—For the erection of a residence at Sully, near Cardiff, for Mr. Richard Wain. Messrs. Veall & Sant, architects :—

		Extra for Oak Joinery, &c.
Shepton & Son	£2,458 7 0	£446 6 0
Chubb & Co.	2,424 0 0	366 2 9
Melhuish Bros.	2,290 0 0	400 0 0
Jas. Allan	2,256 6 6	385 17 8
W. T. Morgan	2,210 0 0	330 0 0
Symonds & Co.	2,204 13 1	336 5 5
Knox & Wells*	2,047 0 0	300 0 0

[All of Cardiff.]

WALTON-ON-THAMES.—For the erection of residence, Beechwood Estate, Oatlands Park, for Mr. Thomas Proudfoot. Mr. J. M. Wales, architect :—

Ingram & Co.	£2,378	W. Greenfield, Weybridge*	£1,650

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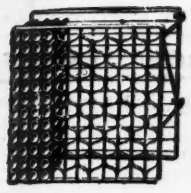

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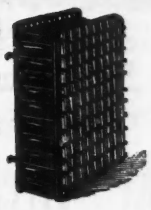

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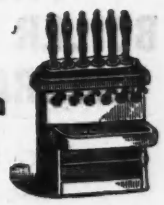

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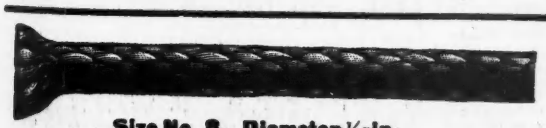

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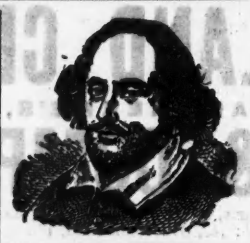
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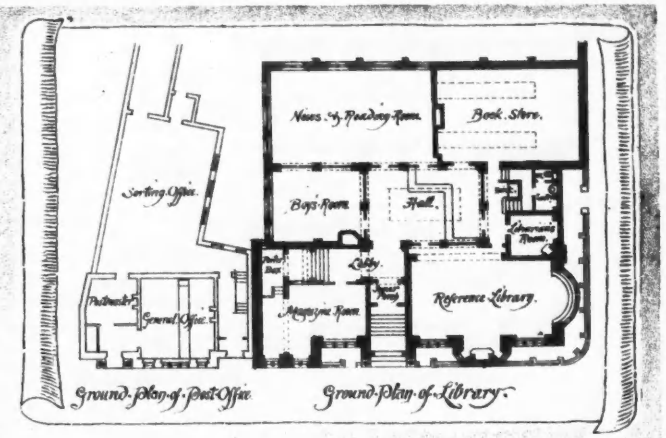

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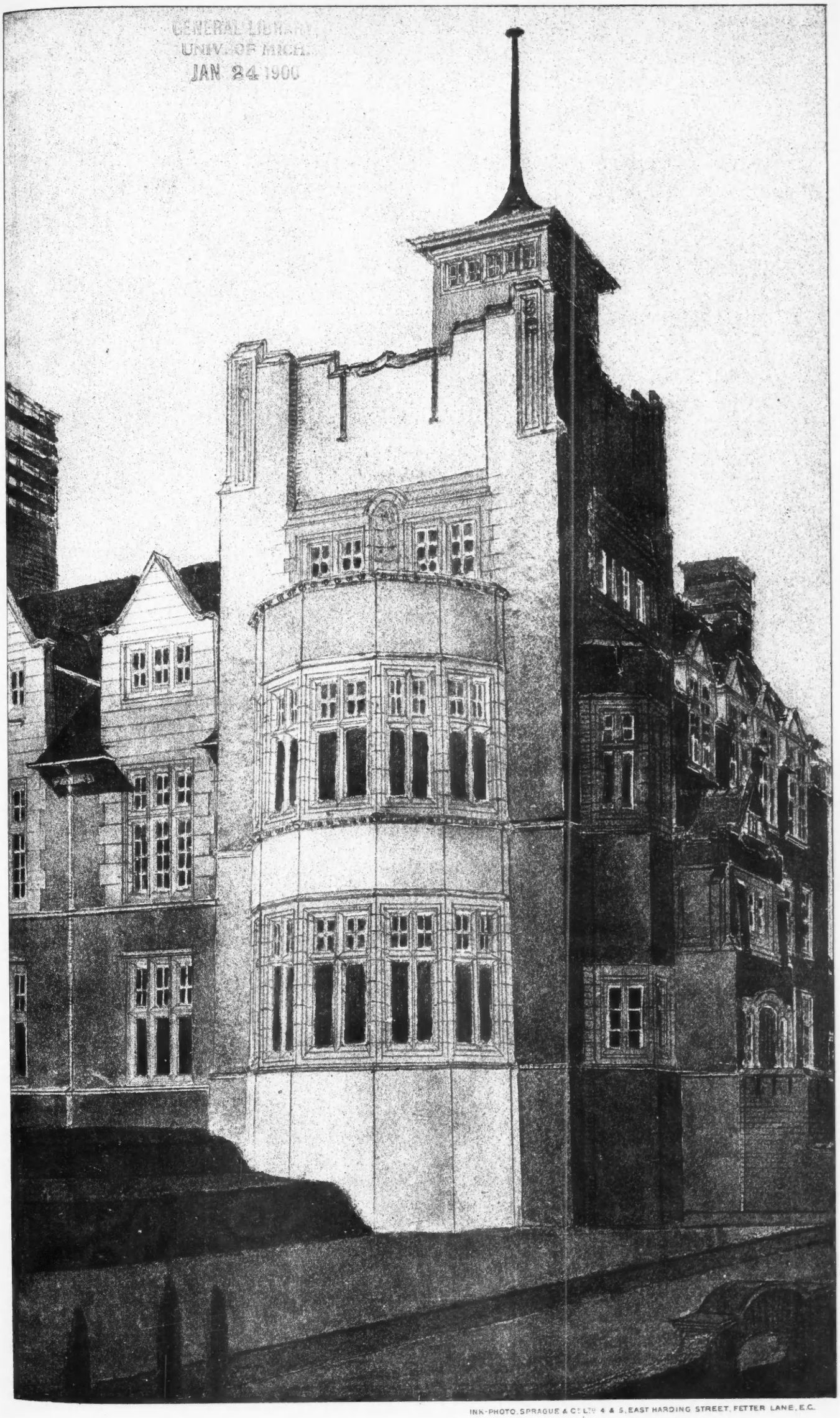

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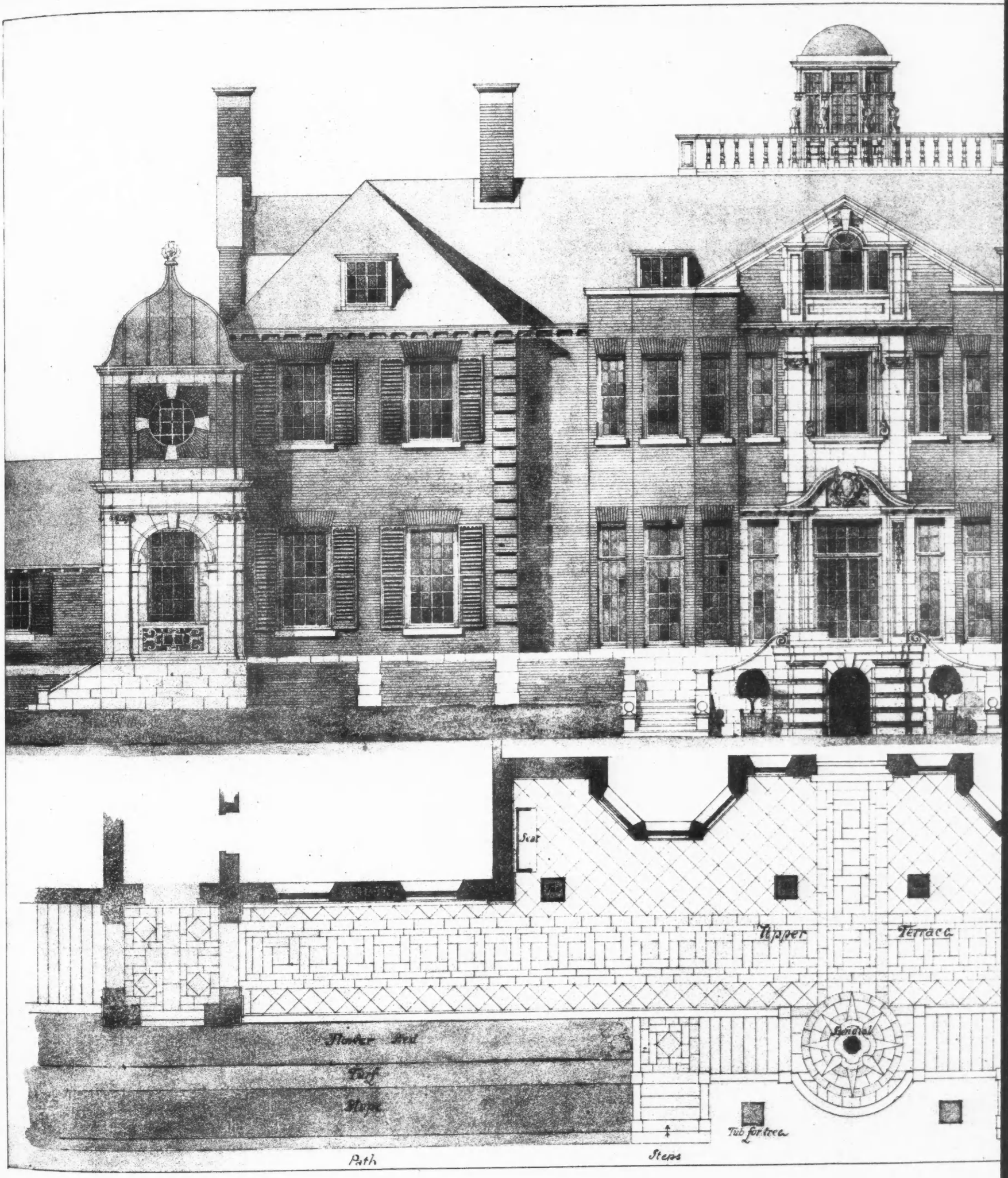

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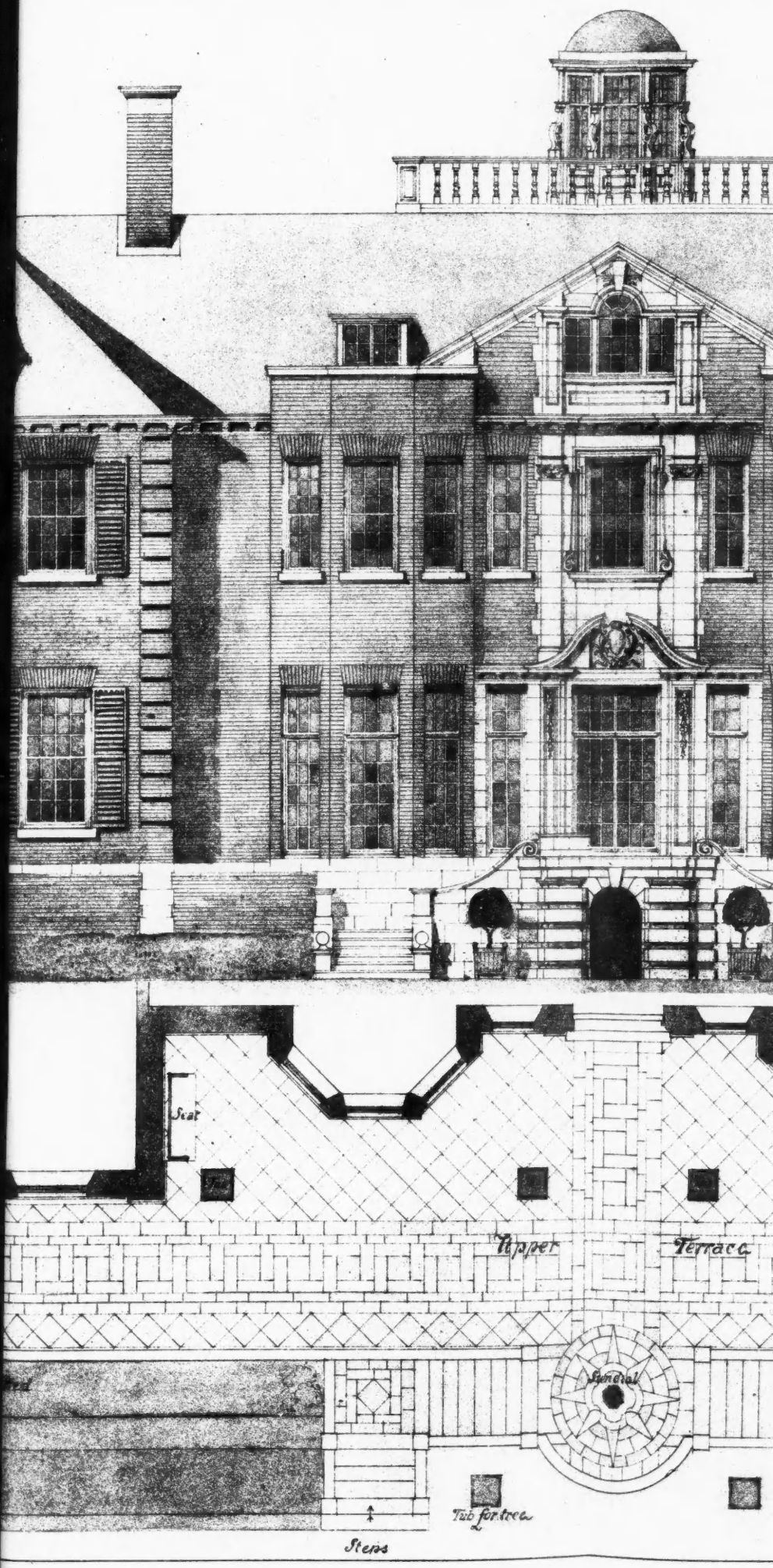

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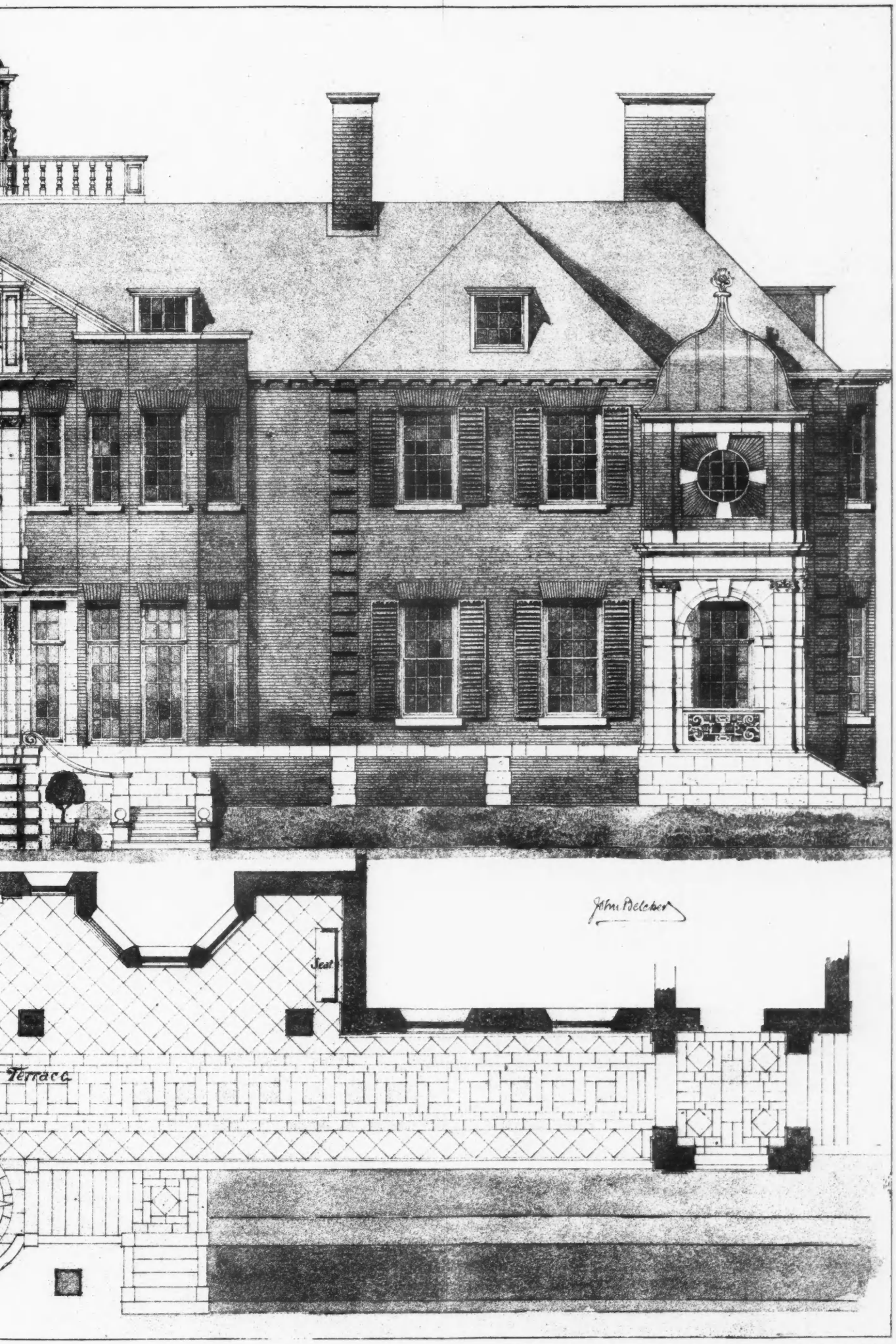

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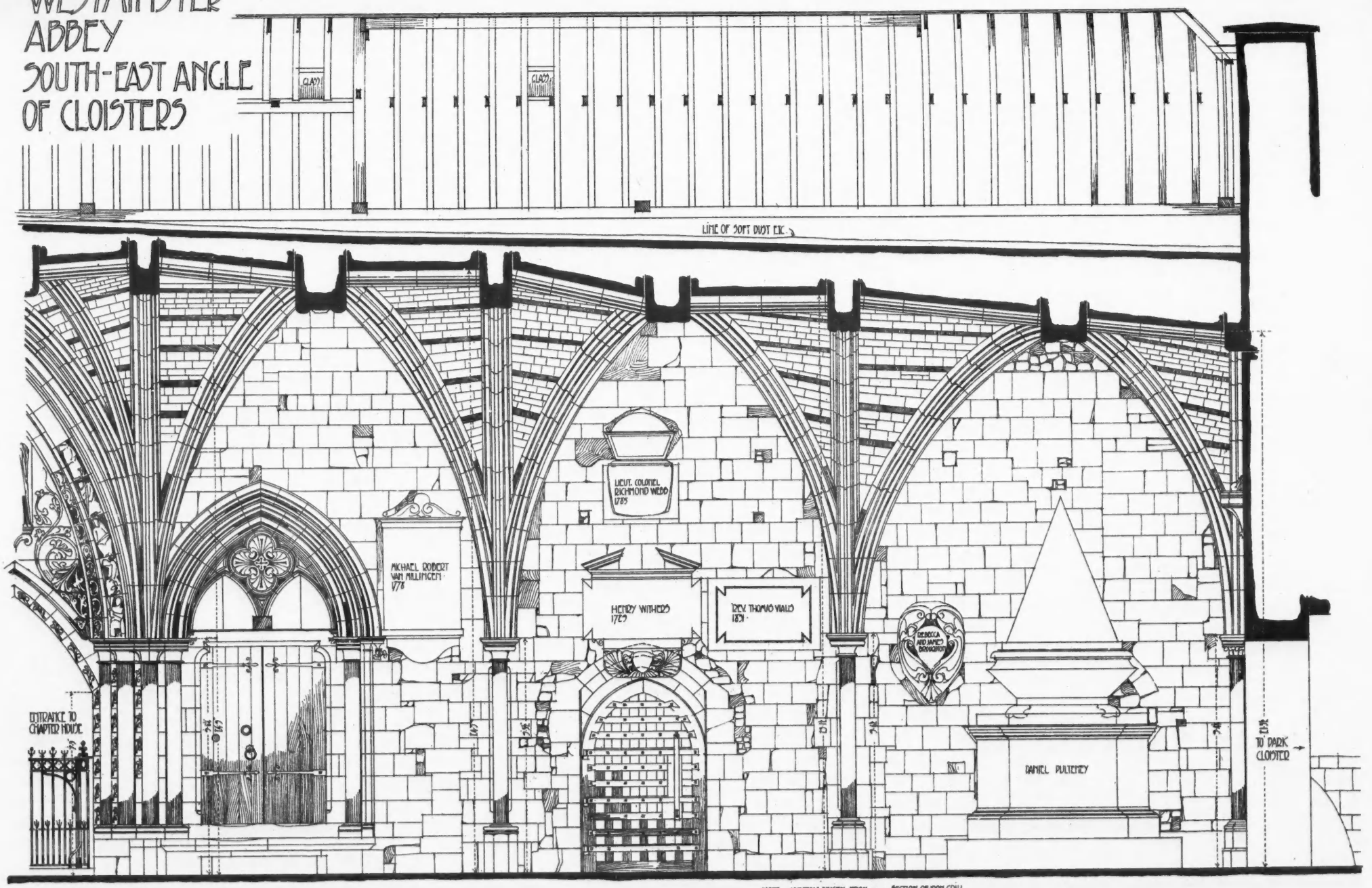

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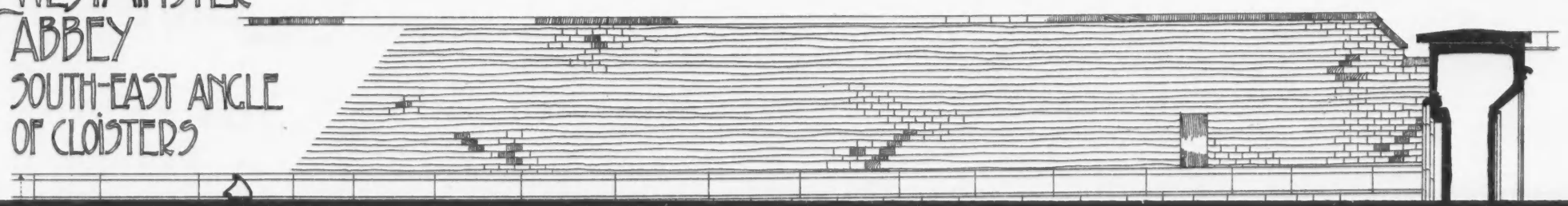

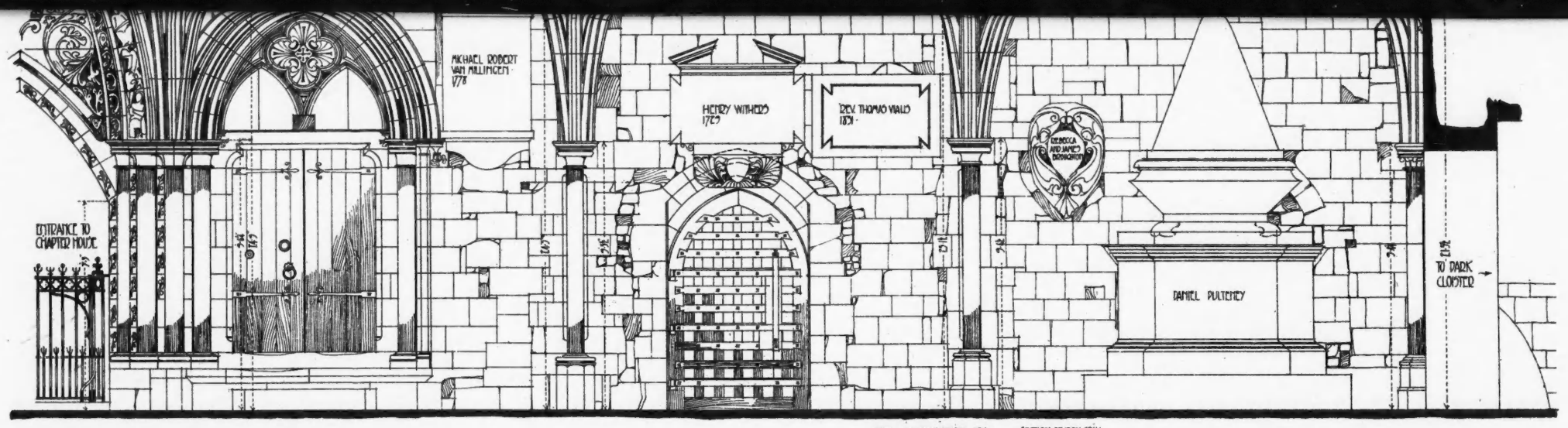

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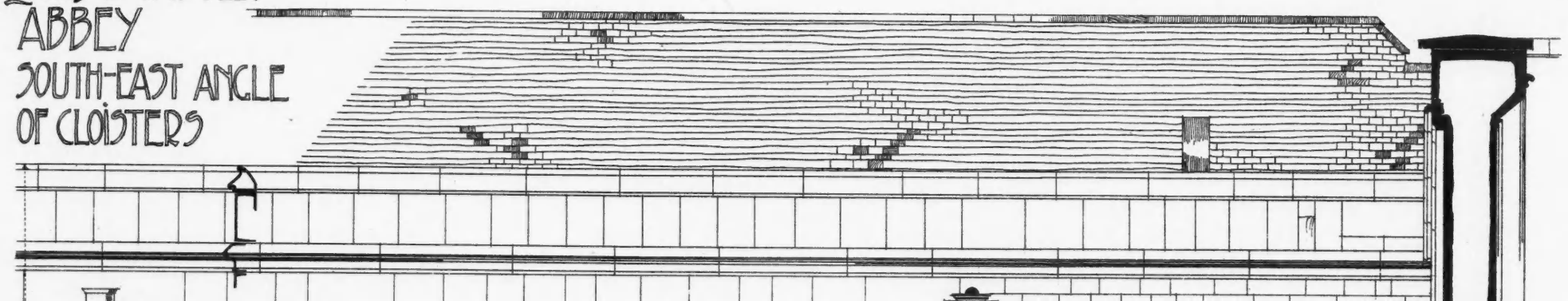

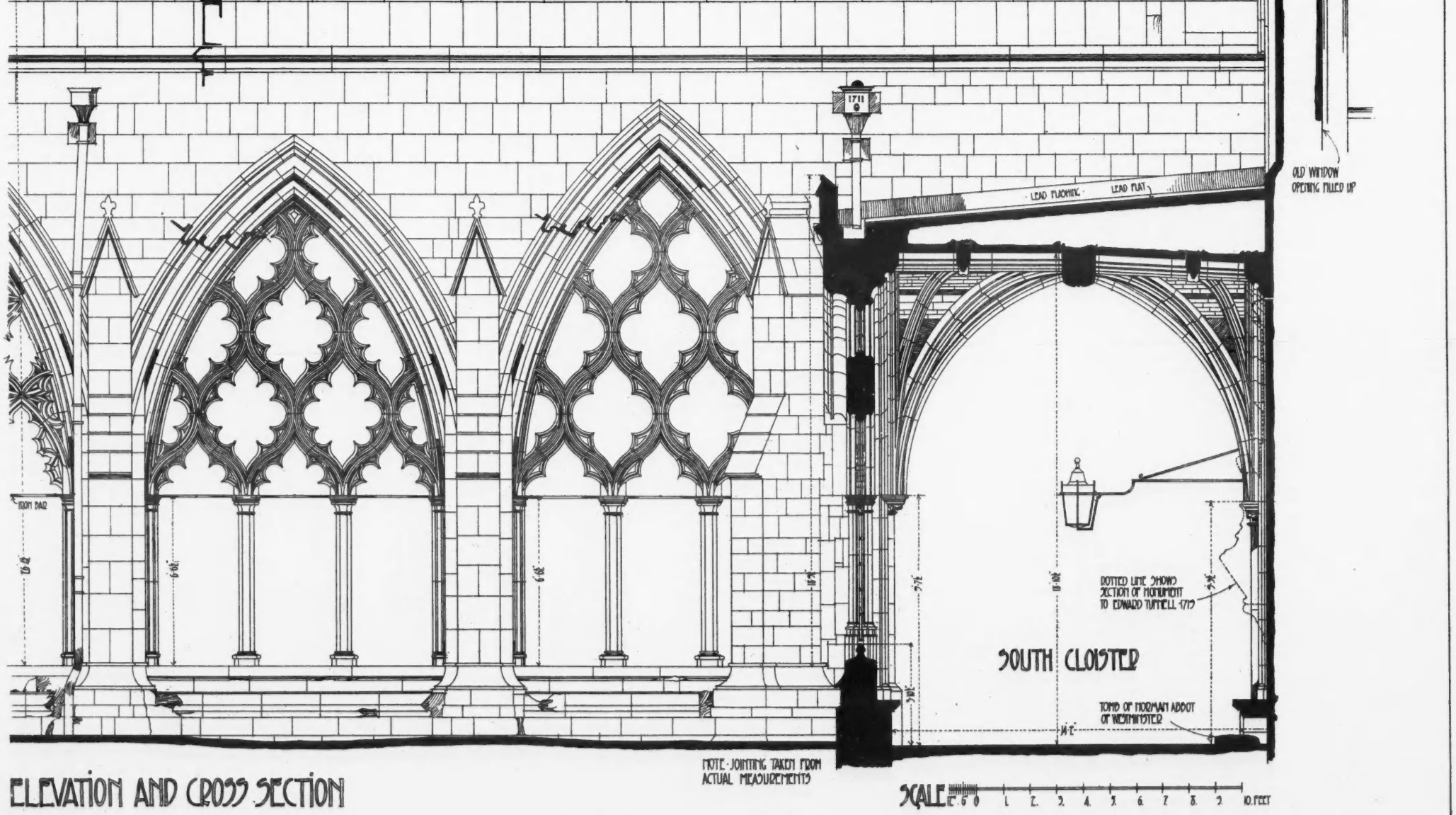
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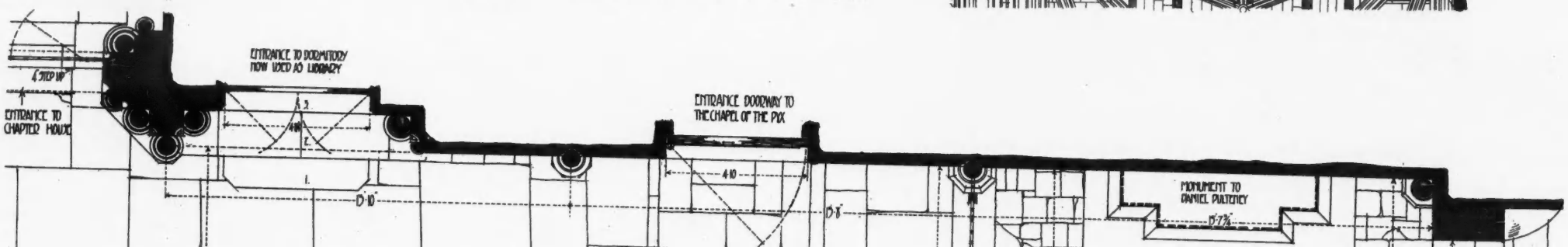

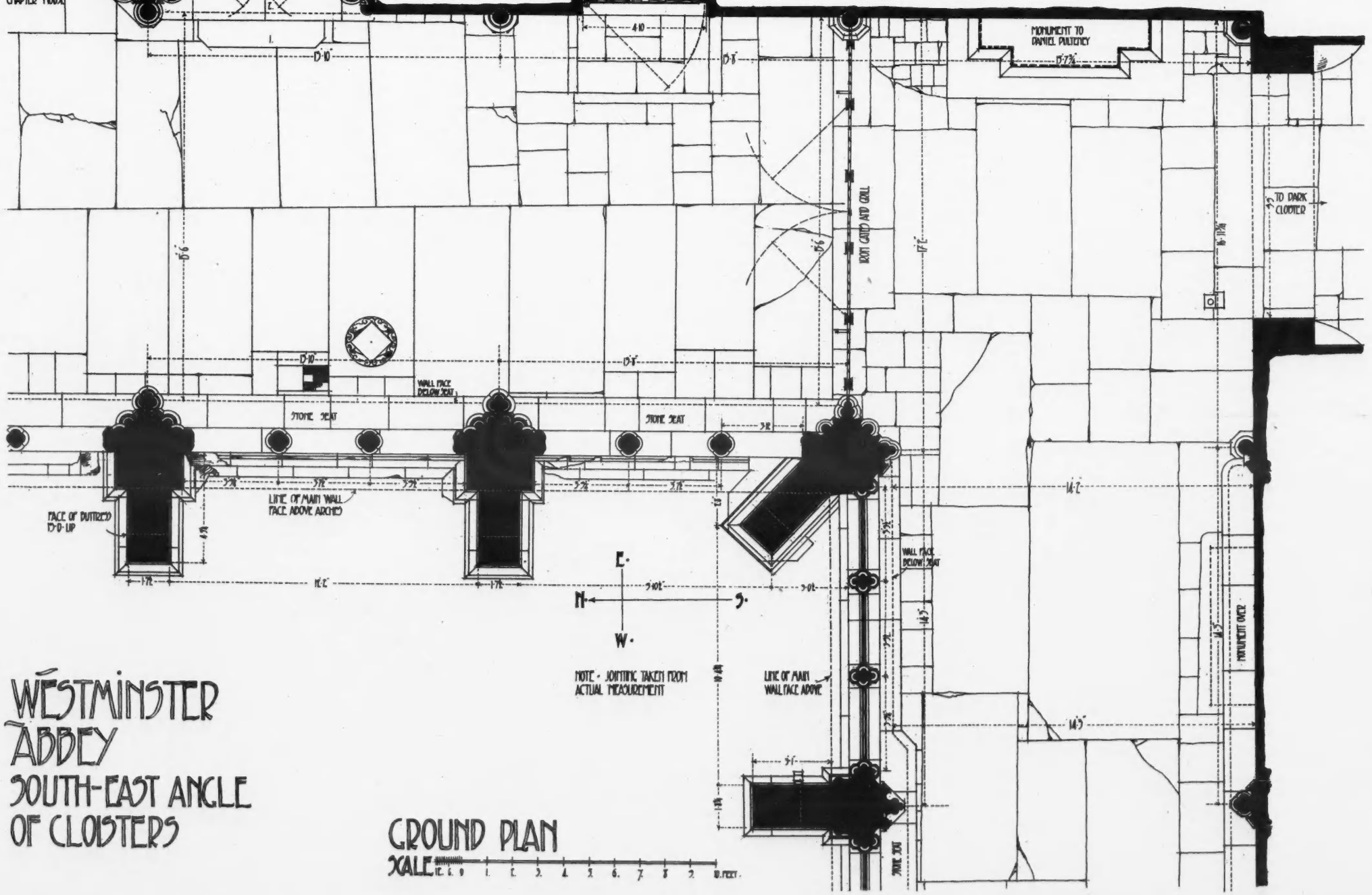

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